

THE Malayan Agricultural Journal.

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EDITORIAL.

The Malayan Coconut Industry.

In the present number we wish to emphasise the growing importance to Malaya of our coconut products. This importance is not being attained by any large increase in areas under the crop, but by comparison with certain other major crops, the prices of which have of late declined to an uneconomic level.

It is true that the prices of both copra and coconut oil have dropped to an alarming degree. In view, however, of the many desirable qualities of coconut oil both for edible and soap-making purposes, and to the fact that the world's exportable supplies do not tend materially to increase, the future prospects of the copra industry may be held to compare favourably with most other agricultural products.

We have frequently drawn attention to the premium which Ceylon copra invariably obtains over the Malayan product. During the past two years, several articles have been published in this Journal dealing with various aspects of this problem and including recommendations which, if put into practice by producers, would result in an improved quality of copra.

Recently we have published a Bulletin written by the officer engaged on copra research, which embodies the investigations on the nature of the differences between Ceylon and Malayan copra and which offers numerous suggestions, the acceptance of which by producers would undoubtedly result in an improvement in quality.

The main criticism of this work has been that even if the quality of Malayan copra be improved, price discrimination will not necessarily follow. There is much to be said for this argument, for it is known that buyers in Europe have established standards of quality for copra of different origin.

Furthermore, Ceylon enjoys her pre-eminent position by reason of the fact that the buyer has been accustomed for many years to look to this source for the highest quality copra.

Now, the market for the finest quality copra is said to be limited and the Trade informed us some three years ago that if Malaya produced copra equal to the Ceylon product, the result would not be that our product would command

the Ceylon premium, but by reason of the extra supplies available, the Ceylon price would approximate to the price of the Malayan standard.

This was depressing information, but such that it could not be ignored. Our continued efforts to improve the quality of Malayan copra were therefore founded on the hope that if the market still further declined, dealers would eventually disregard the lowest quality and that Malaya must at least maintain her position in such an event by maintaining or even improving the quality of her supplies.

The signs for the future, however, are more hopeful than at one time we had dared to anticipate. Messrs. Frank Fehr and Company, in their review of the oil markets in 1931, of which we have made liberal use in the review of the industry which appears on another page, point to the diversion of Ceylon copra to India and state that unless the Indian production increases, this diversion of Ceylon supplies to India is likely to be a permanent feature.

This possibility opens up a new aspect for Malayan copra, and is therefore worthy of closer examination. We have to ask ourselves whether the Indian demand for Ceylon copra is likely to be permanent and if so, what effect this will have be on the Malayan product.

We have no direct evidence concerning the possible increase in coconut areas in India, but there is certainly evidence that India during the past 15 years has found it increasingly difficult to maintain her independence of outside sources of supply. At one time Malabar copra was superior even to that of Ceylon. Her exportable surplus between 1909 and 1916 was about 28,000 tons per annum. Since then the exports of Malabar copra have declined rapidly and for the past four years have entirely ceased.

For a country which held the premier position in an industry to cease to supply the product is an interesting fact. It rather points to the possibility that India's teeming millions will eventually absorb the Ceylon supply, in consequence of which the rest of the world will have to turn to another source for her supply of first quality copra.

In this eventuality, we can see no reason why the improved Malayan copra should not replace the Ceylon product on the world's market.

Experiments on Copra Production.

The need of assisting the small-holder in obtaining a fair market price for his produce was never more urgent than at the present time, as he has experienced a very severe shrinkage of his income and is not always in a position to turn to new means of gaining a livelihood.

A preliminary enquiry into the conditions of marketing native produce has shown that, as a rule, the small-holder receives a fair price for his produce in the form and condition in which it is marketed and in view of financial arrangements between the producer and the middleman.

It follows, therefore, that short of direct interference in open trade, the most promising form of assistance is of such a nature as to help the producer

to improve his own position. It is on these lines that during the past two years the Department of Agriculture has worked in relation to copra production on small holdings.

In this work, two points have had to be kept constantly in the foreground: firstly, the suggested improvements must be of an inexpensive nature so that they may be within the means of the producer; and secondly, careful instruction is necessary, especially in the initial stages, in the preparation of copra on the improved kilns.

Native producers are rather apt to look upon the kiln as an achievement in itself rather than as a means to an end. This is borne out by Messrs. Cooke and Simpson in an article on the subject of their efforts to improve copra production by the Malay small-holder. They state that the result of the successful operation of a limited number of kilns was an increase in six months from 6 to 120 small kilns in the sub-district in which the authors were working. It is not claimed, however, that all these Malay producers are manufacturing good dry copra. It is evident that more effective supervision should be given to these small-holders, not only during the erection of the new kilns, but more especially in the early stages of operation.

The Department proposes to give the very widest publicity amongst Malays to these improved methods of drying and marketing copra. This will be effected by the publication in the Malay language of the information contained in the article on copra production and the free distribution of the Malay circulars in suitable districts. Furthermore, officers of the Field Branch of the Department will be requested to give this subject their close attention in coconut areas owned by Malays so that the published information on this subject, supplemented by careful instruction, may result in no waste of effort—the frequent outcome of a wave of enthusiasm—nor failure by reason of the lack of appreciation of all the factors which need consideration, not only on the preparation of improved copra but on satisfactory marketing methods.

Copra Deterioration.

An article by F. R. Passmore, published in the Bulletin of the Imperial Institute, provides a valuable link between the work which is being conducted in Malaya on the causes and nature of copra deterioration by moulds and insects and the effect thereof on the copra as judged by manufacturers and shippers whose opinions are reflected in price discriminations.

The article by Messrs. Ward and Cooke included in this number sets out the attitude of the manufacturers as established by Passmore, and shews the conditions favourable for the incidence of insects and moulds and the methods by which the undesirable characteristics resulting from their attacks may be avoided.

We would observe that although little financial advantage is likely to result from spasmodic or isolated attempts to improve the quality of copra exported

from Malaya, yet concerted action by copra producers to market a better article is likely to attract buyers and lead to a general preference for Malayan copra and ultimately to a price discrimination in our favour.

Food Requirements of Coconuts.

We have previously pointed out in these pages that an indication of manuring requirements. It may easily occur, analysis of the plant foods removed by a crop is no sure for instance, that a plant food which is found in the crop in relatively small quantities is the one which the plant finds most difficulty in assimilating and which therefore proves the limiting factor of development of the plant. The application of such a plant food in an available form may, therefore, have a very marked effect on the crop, in spite of the fact that the element is already present in the soil in considerable quantities though possibly it is largely unavailable for the particular plant.

Admitting these limitations to the study of plant nutrients removed by the coconut tree, as discussed by Messrs. Georgi and Gunn Lay Teik in this number, the results at which they arrive indicate that even supposing that the plant foods contained in the leaves and inflorescences are all returned to the soil, the plant foods in the nuts which are permanently removed from the estate represent a loss which, unless rectified by manuring, may be expected ultimately to have an adverse effect on the health and yield of the plantation.

The period which must elapse before the adverse effect begins to be marked naturally varies with the initial richness of the soil and there is no evidence that it is not being approached on the majority of the coconut estates on coastal soils in Malaya.

The results of these analyses also shew the very great manurial value of leaves and inflorescences and the advisability, therefore, of ensuring the efficient disposal of this material so that the plant foods they contain may again be at the disposal of the palms.

Information on Pests.

In order that planters may be on the lookout for pests, which, perhaps only seasonally, are found to cause damage to crops, and particularly with the object of giving wide publicity to the methods of combatting such pests, Mr. G. H. Corbett, Government Entomologist, has for the past two years contributed quarterly to this journal an interesting series of Entomological Notes.

Much of the information given in these Notes is the result of recent investigations and foreshadows more exhaustive accounts to be published either in these pages or as Special Bulletins.

We suggest that it is to the advantage of all planters to glance through the Notes as they appear, to ascertain whether references are made therein to pests of particular crops on which they are interested.

A large number of enquiries are received by the Entomological Division of the Department from planters whose crops are damaged by insects pests, and

we would emphasise that it is always advisable to notify the Entomologist as soon as possible of the existence of a pest which threatens to cause widespread damage so that, if necessary, action may be taken to restrict the area damaged and to combat the insects before they become too numerous.

It may be pointed out, however, that much waste of time can occur through failure to give full information regarding the extent and nature of the damage caused by an insect pest, as well as through lack of observation of proper precautions in sending to the Department specimens and material for examination. On this account, Mr. Corbett includes in his Notes in this issue "Directions for Mailing Specimens of Insects" which were first published in this journal twelve years ago.

Inter-Departmental Agricultural Conference. The principle that a country should concentrate on the production of crops for which it is pre-eminently suited and rely on imports of such other agricultural products as it requires, the local cultivation of which is likely to prove less remunerative, is a policy with which we are in agreement. It results in adequate world supplies and the most economic production.

The application of this policy to Malaya has in the past proved of material benefit and we have no cause to regret the fact that this country has taken such a large share in supplying the world's requirements of rubber.

The fact that the world demand for rubber is at present adequately catered for is no reason for the elimination of the present areas under this crop, except in such areas as are obviously unsuitable. It does, however, make more imperative the necessity of finding other avenues for agricultural enterprise.

Furthermore, the present situation has emphasised the desirability of increasing the production of foodstuffs, provided that such industries are capable of economic development.

It is from this point of view that we shall approach the work of the Inter-Departmental Agricultural Conference, the objects of which are set forth in the Departmental Notes included in this issue.

Original Articles.

COCONUTS AND COPRA IN 1931.

Shipments of Copra and Coconut Oil.

The total estimated world shipments of copra in 1931 were 803,020 tons, as compared with 812,883 tons 1930 and 877,869 tons in 1929. The average annual world shipments for the period 1927-31 were 823,392 tons, as compared with 631,423 tons annually for the period 1922-26. The year of greatest shipments was 1928, with 905,732 tons.

The following are the approximate figures of shipments of copra from the chief producing countries in 1931 and the gross imports of the most important consuming countries for the same year.

COPRA SHIPMENTS.			COPRA IMPORTS.		
		Tons.			Tons.
Netherlands India	...	360,000	United States of America		240,000
Philippines	...	178,000	France	...	192,000
Malaya	...	176,000	Germany	...	143,000
South Sea Islands	...	100,000	United Kingdom	...	93,000
Ceylon	...	89,000	Holland	...	87,000
Zanzibar	...	15,000	Denmark	...	71,000

The following shews the chief exporters and importers of coconut oil in 1931.

COCONUT OIL EXPORTS.			COCONUT OIL IMPORTS.		
		Tons.			Tons.
Philippines	...	158,219	United States of America		145,167
Ceylon	...	48,139	United Kingdom	...	43,423
India	...	22,307	Germany	...	6,651
Malaya	...	10,159	France	...	5,000
Netherlands India	...	3,367			

Copra Prices.

There have been considerable fluctuations in prices. During the first half of the year the downward trend in values continued. Commencing at £15.5.0., the average price of Straits F.M.S. copra, c.i.f. London, for January, 1931, values declined to an average for August and September of £11.17.6. In June the quotations at one time touched as low as £10.17.6 for D.E.I. and Straits F.M.S. copra.

A sharp appreciation in price was occasioned by the departure of Great Britain from the Gold Standard. For October the price for Straits F.M.S. averaged £14.5.0 and for December £15.7.6.

During October and November, due to large arrivals at Marseilles and the poor demand on the part of the French Crushers, prices of D.E.I. and Straits

F.M. and South Sea kiln-dried copra fell heavily, there being a wide discount for F.M., South Seas and Straits F.M. as compared with the Straits F.M.S. quality.

While this low level of prices was ruling, U.S.A. buyers entered the market and bought fairly heavily for January and February shipments. The pressure of supplies on Marseilles being relieved, prices recovered to more or less normal parity with other grades.

Messrs Frank Fehr & Co. in their review of the copra market for 1931, make the following very interesting observations regarding the supplies of Ceylon copra.

"A further outstanding feature has been the movements in the price of Ceylon copra. The normal premium of say 10 s. to 20 s., which is obtainable for Ceylon F.M.S. copra over Straits and D.E.I. F.M.S. copra, has increased, and at the end of January Ceylon was quoted at about £4 premium. This is due to the falling off in arrivals and to a phenomenal demand which has arisen since November for Ceylon oil in India.

"Commencing from 1st. January, 1932, there was a reduction in the Indian import duties on Ceylon copra of £1.10.0 per ton, and on Ceylon coconut oil of £2 per ton.

"The present duty is about £6 per ton on coconut oil and £3.5.0 per ton on copra.

"Unless, therefore, the supplies of Indian copra increase, the diversion of large supplies of Ceylon copra to India will be a permanent feature, and, in consequence, the surplus available for export from Ceylon to Europe will tend to diminish.

"The present price of copra in Ceylon is at a parity of £20 c.i.f. Europe, compared with present price of £17.10.0 c.i.f. Europe for Straits F.M.S. copra.

"The average price of Straits F.M.S. copra in December, 1931, was £15.7.6, and this works out upon a gold basis to £11.2.6, or near to the low record price for copra. There are signs that at this level exports are effected and that larger quantities are retained for consumption at origin".

Prices of Coconut Oil.

Prices of Manila coconut oil, c.i.f. New York reached unprecedented low levels during 1931. The year started with an average price in January of 5 cents per lb., which had been reduced in December to 3 7/8 cents.

At various periods during 1931 offers of Manila coconut oil were made to the European market at attractive levels, but did not result in any business of importance.

From August to early November, an especially large business was done in Ceylon coconut oil to European ports, at prices which were thoroughly competitive with European crushed oil. During December, however, India was prepared to pay better prices than were obtainable in Europe, and subsequently practically no business was possible to the United Kingdom or the Continent.

The Indian demand is chiefly due to the high prices ruling for Malabar copra. The business was also assisted by the Indian Government having reduced the import duty on Ceylon coconut oil: the reduction in the duty equals about £2 per ton.

Prices of Ceylon coconut oil during 1931 declined at about the same rate as for other vegetable oils, but towards the end of the year they shewed a remarkable recovery.

The year started with an average price in January for Ceylon mill oil of 24 s. 3d. per cwt., c.i.f. usual European ports. Almost without any reaction, prices declined, the average for August being 18 s. 9d. The lowest price at which business was done was 16 s. 6d. During the early part of September an improvement set in, which, during the latter part of that month, was assisted by the fact that the British Government temporarily abandoned the Gold Standard. In December the average price had recovered to 25 s.

The Malayan Copra Industry in 1931.

During 1931 the market for coconut oil, as for other vegetable oils and fats including palm oil, was adversely affected by the economic conditions which prevailed during the year. The production of all raw materials of this type has increased enormously during the last two or three years, being in 1931 approximately 50 per cent. higher than a few years before, while at the same time consumption has failed to expand in the same manner. Market prices sagged more or less continuously until September when they were sharply affected by the suspension of the Gold Standard and the chaotic state into which the principal exchanges were thrown in consequence. Two factors appear to have influenced the situation, namely, that as a result of the accumulation of stocks of whale oil, the whalers decided to lay up their fleet in March 1931, as the surplus available was regarded as sufficient to cover the demands for the next twelve months. The other factor which has influenced the market has been the disturbed conditions in Manchuria which have seriously curtailed the supplies available of soya bean oil. It should be emphasised that as these markets for edible fats are all connected, the disturbance of any source of supply necessary affects the position of other industries.

Local Prices.

In relation to copra the market opened in January at \$5.73 per picul for Sundried and \$5.30 per picul for Mixed. It declined more or less steadily until June when a low record of \$3.80 per picul for Mixed was established. Thereafter small rises took place, but towards the end of the year the position improved considerably, the average price at Singapore was \$5.71 per picul for Sundried and \$5.09 for Mixed.

The average Singapore price of copra Sundried and of Mixed qualities during the year were respectively \$5.09 and \$4.64 per picul as compared with \$7.80 and \$7.45 for 1930.

The local prices in the coastal villages for copra prepared on primitive kilns from nuts grown by small-holders have ranged from \$2.50—\$4.50 per picul, and the prices of nuts for copra from 80 cents to \$1.80 per hundred. In the inland villages nuts sold for eating purposes at prices varying from 2 to 10 cents and averaging about 5 cents each, according to the size of the nuts and the supply locally available. In many of the inland districts nuts have to be imported from the coastal areas to meet the demand for local consumption.

Area Planted in Malaya.

The statistics for the area under coconuts have not been revised as it is considered that the very close census taken in 1930 continued to represent the planted area. The 1930 census placed the area under the crop at approximately 600,000 acres.

Malayan Export and Production.

The export of fresh coconuts in 1931 was almost identical with that of the previous year being 10,648 tons. The net exports of copra were 100,809 tons valued at \$9,677,676 as compared with 102,014 tons valued at \$15,307,511 in 1930. In view of the fact that net exports of coconut oil in 1931 were 9,909 tons or 436 tons greater than in the previous year, it may be assumed that the production of copra in the year under review was practically the same as in the previous year.

It is difficult to form even a rough estimate of the total production of coconuts in Malaya. While it is true that some 90,000 acres of estates together with well defined blocks of small holdings are situated in the coastal districts of Perak and Selangor, it has also to be remembered that a few palms are commonly planted near the dwellings of many Malays and other Asiatics throughout the country. The crops produced on estates are utilised almost entirely for the production of copra, but in the coastal districts the crops from small holdings are used both to satisfy the local demand for fresh nuts and for conversion into copra, while nuts produced in the inland districts are all consumed fresh. Moreover, a small portion of the copra made is purchased by two oil mills in Selangor, the oil and cake from which are not expected in large quantities. Consequently, the known exports of copra have little relation to the total production of nuts, more especially as the crop of nuts per acre and the number of nuts per picul of copra are subject to wide variation.

Investigations.

The standardised coconut experiments laid down in 1930 on five estates in the Federated Malay States and two in the Colony have been continued, but have not yet been in progress long enough to give definite results. Selection, cultivation, manuring and cross-pollination experiments have been continued at the Experiment Station, Klang, and on Carey Island.

Investigation on improved methods of preparing copra, which are being

undertaken with financial assistance from the Empire Marketing Board, have commenced to give valuable information. The officer engaged in this work visited Ceylon in August to make a comparative study of methods of coconut cultivation and copra preparation in that Island. A report giving the results obtained to the end of 1931 has recently been published. It has been definitely established that Malayan copra is inferior in quality to that prepared in Ceylon, and that this inferiority is due less to climatic factors than to careless harvesting of nuts on small holdings and to methods of preparation on properties of all sizes which frequently leave room for improvement. Of particular importance in lowering the quality of the copra produced are defects in the details of construction of the kilns used. Existing kilns on a number of estates have been found to exhibit one or more such defects which can, however, as a result of these investigations, often be remedied at a comparatively low cost. Kilns used by small-holders, or middlemen manufacturing copra on a small scale, are usually very primitive. Consequently, investigations are in progress with a view to providing a standard design of small, cheap, but efficient kiln.

Enquiries into local marketing methods and associated economic factors indicated that the first steps towards improved local prices in the principal areas of small coconut holdings are the preparation of copra by the growers themselves, in preference to the sale of the nuts to middlemen manufacturers, and improvement in the quality of the product by better methods of harvesting and by the use of small cheap kilns of approved design, erected in fairly large numbers to serve groups of neighbours throughout these areas. In Kuala Selangor District two or three members of the community have erected kilns designed by the Department of Agriculture and have prepared copra of improved quality, selling for prices which have not only given them a better profit on their own nuts, but have enabled them to purchase nuts from their neighbours at prices above those given by the local middlemen manufacturers.

Pests.

The coconut beetle (*Oryctes rhinoceros*) was kept under control throughout the year by the usual methods of destroying suitable breeding places. The nettle caterpillar (*Setora nitens*) appeared again in one district in the first half of the year and on one or two estates required special efforts on the part of the managers to effect its control.

Acknowledgments.

The information on shipments and prices of copra and coconut oil are abstracted from the "Review of the Oil Seed, Oil and Oil Cake Markets for 1931" published by Messrs. Frank Fehr and Company to whom we tender our most grateful thanks.

The portion of the above article dealing with the Malayan Industry in 1931 is part of the Annual Report for 1931 of the Director of Agriculture, S.S. and F.M.S.

COPRA PRODUCTION BY THE MALAY SMALL-HOLDER

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Introduction.

A letter received in July 1930 from certain residents of the mukim of Jeram on the Selangor coast revealed that the owners of coconut holdings were in considerable financial difficulty owing to the low price paid by dealers for their coconuts.

As a result of this letter, officers from the Agricultural and the Co-operative Departments proceeded to investigate the position, to determine whether the financial circumstances of the small-holders could be ameliorated.

The Jeram Malay Reservation.

The reservation, which is situated on the Kuala Selangor road, consists of 1,367 holdings, all under 100 acres, made up as follows:—

Mature Coconuts (approx. 30 years)	...	4,361 acres
Immature Coconuts	...	897 ..

The usual size of a holding was about 6 acres, and each supported one large family.

In appearance, the palms were exceptionally good for small-holding conditions, and they gave an abundant crop of large nuts.

Crop Disposal.

The practice adopted by the Malays in the disposal of their coconut harvests has generally been to sell their nuts while they were still on the palms to a middleman producer, who usually harvested every sizable nut, with the result that an extremely large percentage of very unripe nuts was included in the crop taken.

Thus a loss was incurred, since some 300 nuts would be required to make a picul (133½ lbs.) of copra, whereas using only ripe nuts between 230 and 250 nuts would yield a similar quantity of copra.

Furthermore, the presence of these unripe nuts and careless methods of preparation, in addition, gave copra of low quality and high moisture content, with the result that a low price was received by the middleman producer from the local dealer.

It will be appreciated, however, that while the middleman producer, the local dealer, and the ultimate buyer could all operate on the basis of a regular

percentage on turnover, the whole of the financial loss occasioned by careless methods was borne by the grower, who received a low contract rate for his nuts.

Forward Contracts and Debt.

The situation was further complicated by the fact that a large number of the inhabitants of the Reservation were in debt and as a result had been compelled to sell their crop forward at a very low price. While the usual price paid for average-sized nuts, delivered at the roadside, to the "free" small-holder was about 14 cents for 10 nuts, as little as 1 cent a nut was recorded as a forward contract made in good times, where the whole of the work was organised by the middleman producer, and where a condition of serious indebtedness existed.

- It was estimated that of the 1,367 holdings
 - 30 per cent. that is some 400 were free of debt
 - 40 per cent. that is some 550 were free of forward contracts but not of debt
 - 30 per cent. that is some 400 were in debt and tied by forward contracts.

The Income of the Small-holder.

It will be appreciated that a good 6 acre holding, yielding some 15,000 nuts per annum would normally provide a "free" owner, at the average price quoted, with an annual income of about \$210 from which he would have to find certain expenses of upkeep. A less prolific area of the same size, the owner of which was in debt and receiving only 1 cent per nut would obtain only \$100 for his annual crop.

Possibilities of Improvement.

With nuts priced at 14 cents per 10 and using ripe nuts only, the equivalent value of the dry copra will be \$3.29 per picul. Sundried copra, valued at \$6.75 at Singapore, will be worth about \$5.75 at Jeram, so that the balance available, if careful production is practised, is \$2.46 per picul.

The middlemen producers, however, generally produce "mixed" or even lower grade copra, and on the assumption that 280 nuts of assorted ripeness will be required to make a picul of dry low grade copra, worth locally \$5.00, it may be estimated that the intermediaries between them absorb about \$1.10 per picul in commission charges for collecting, transporting and preparing nuts, for preparing and bagging copra and for the financial risks incurred.

Thus the avoidable loss to the grower, and incidentally to the trade of the country, amounts to over \$1.00 per picul of copra traded. On the basis of 75,000 tons of small-holders' copra as a nett annual export, the loss to the country may exceed \$1,200,000 annually, since similar and worse conditions exist in all districts where such copra is manufactured.

Efforts by the Small-holders.

Financial adversity had already induced the more progressive to make some efforts on their own behalf and at the time of the first visit, 8 kilns had recently been erected, but owing to inexperience and to the crudity of the kilns, the quality of the copra produced was most unsatisfactory.

The safe low price of only \$4.00 per picul was offered for their half-dried or "wet" copra by the speculative local dealer, but even this price was sufficient incentive to continue production, since the equivalent nut price is approximately equal to 16 cents for 10 nuts which is an advance of 2 cents on simple nut sale.

Preliminary Conclusions.

The conclusions arrived at as a result of these preliminary investigations were as follows—

- (1) The exceptionally low price for nuts was caused in the first place by the world financial depression.
- (2) Relatively low prices for nuts, however, are always paid by the middleman producer to the grower.
- (3) These low prices are due to two causes—
 - (a) Careless methods of copra manufacture by the middleman producer, who receives a low price for his copra from the dealer.
 - (b) The frequent indebtedness of the grower to the middleman producer.
- (4) A central organisation for purchasing wet deteriorated copra and redrying and grading it, would not bring better prices either to the producer or to the grower.
- (5) Prevention by law of dealings in low-grade copra is impracticable.
- (6) Increased manufacture of copra by or on behalf of growers is therefore essential. The erection of a large central drying dépôt is not to be recommended owing to the inaccessibility of the small holdings.
- (7) The erection of small kilns of improved design, suited to the needs of growers and small groups of small-holders offers a likely solution to the difficulty.
- (8) It is quite probable that the small-holders will revert to simple nut sale when prosperous times return.

Experiments with Small Kilns in Kuala Selangor.

Two small-holders were selected by the Malay Agricultural Assistant, Kuala Selangor, for special instruction and assistance in copra manufacture.

The objects of the experiments were as follows—

- (1) To demonstrate that good copra could be made on small inexpensive kilns.
- (2) To determine what response was forthcoming from the small-holder.
- (3) To ascertain what marketing difficulties were to be expected.

Work was commenced in August 1931 and by February 1932, one producer was in a position to make copra of No. 1 quality.

Scheme 1.

A Javanese small-holder, a man of some wealth and the owner of 20 acres of mature coconuts, was persuaded to rebuild his crude kiln, using brick and iron as materials of construction. The kiln, when completed, was too large for his own requirements, since his annual crop amounted to only one ninth of the kiln capacity, and so when the production of good dry copra had become an accomplished fact, it was decided to push the scheme a stage further. The owner was accordingly persuaded by the Malay Agricultural Assistant to assist his countrymen and incidentally to reduce his own overhead charges by extending his business. The kiln owner, in turn, persuaded twelve of his neighbours, owning between them some 60 acres of mature coconuts, to consider two alternatives, either—

- (a) to sell all their nuts to him, or
- (b) to allow him to manufacture copra for them on commission.

The first alternative was chosen, so leaving the kiln owner the sole responsibility of manufacturer and marketing, and incidentally, giving him a satisfactorily large quantity of copra for him to approach a large dealer.

The Purchase of Contributors' Nuts.

His method of nut purchase allowed for fluctuations in the price of nuts and for seasonal variations in the ratio of nuts required to make a picul of copra. An example may be quoted—

January 1931 —

235 nuts = 1 picul of copra.

Therefore 100 nuts = .42 picul of copra.

Hence with good dry copra (i.e. "sundried") fetching \$6.75 (Singapore) and say \$5.75 locally, the copra value of 100 nuts was $.42 \times 5.57 = \$2.32$.

From this, he deducted a manufacturing commission of 30—35 cents per 100 nuts, so leaving a balance of about \$2.00 which he paid to his contributors. This is equivalent to a price of 20 cents for 10 nuts.

Competition from Middleman Producers.

The response on the part of the middlemen producers was to advance the price of nuts by approximately 30 per cent. in order to undermine the loyalty of this unwelcome organisation and pressure was also brought to bear on the dealer who bought the copra from the owner of the new kiln.

Owing to the high quality of the copra he produced, the Javanese manufacturer was always able to pay 2 cents per 10 nuts in excess of the middlemen's top price while the intimidation of the dealer was stopped and his continued support secured as a result of the efforts of the District Officer, Kuala Selangor.

The exceptionally high price offered for nuts attracted considerable attention to this man's work, so that after the first month, no further difficulty was experienced in obtaining sufficient nuts to keep his kiln in continuous operation.

Scheme 2.

A Malay small-holder, the owner of one of the eight crude kilns, previously referred to, was easily persuaded to build a small kiln of improved design, since his first efforts on his own kiln gave a product which was almost unmarketable.

His resources did not permit of the expense of brick and iron constructions and instead clay, coconut timber and attap were used.

Some difficulty was experienced, initially, in persuading the owner to follow a satisfactory method of production, but ultimately he was able to produce copra which was better than average middleman's copra. Since, however, he could not obtain top price, he was unable to offer a high price for nuts and so could not attract regular contributors to his kiln, which was of sufficient capacity to deal with the crop of at least three average-sized small holdings.

The Effect of these Experiments.

On Copra Production.

The most outstanding and direct result of these endeavours is that the number of kilns owned by Malays in Jeram has increased progressively, thus—

August 1930	...	...	...	...	...	6
November 1930	...	...	...	...	...	30
August 1931	...	...	...	...	...	35
February 1932	...	...	...	...	...	120

It cannot be claimed that all these Malay producers are manufacturing good dry copra; in fact, the converse has definitely been stated by an important dealer, viz. that "Malay-produced copra is, in general, much inferior to middlemen producers copra, bad as that is!"

This is due to the fact that at present, effective supervision is impossible and that under existing conditions, individual or group education cannot be undertaken. Whatever progress has already been made is the result of imitation, and lacks the corrective of close criticism.

This indicates that, without adequate instruction, the copra received is likely to be of very mixed quality and that an ambitious large-scale organisation for co-operative marketing of their produce would involve complicated dealings, if profit is to be justly apportioned, and additional expense, on account of the necessity for redrying and grading the product before sale.

On Copra Prices.

Originally and with similar Singapore prices, a standard price of \$4.00 per picul was offered for the "wet" low-grade copra produced on the six crude Malay-owned kilns.

The Javanese producer is now obtaining \$5.75 for his dry "Sundried" copra, the Malay \$5.00 for his dry "mixed" copra, while the imitating Malay small-holders are obtaining between \$4.40 and \$4.80 for their "wet" low-grade copra.

On Nuts Sale.

These two small schemes have resulted in a similar general improvement, and whereas originally 1 cent and 1.4 cents per nut was recorded for "tied" and "free" growers, the price now offered is about 1.4 cents and 1.8 cents respectively, while the Javanese producer, in an unassailable position, is able to offer 2 cents and still prosper.

Further to prove this contention, the case of the near-by District of Kuala Langat may be quoted, since in September 1930 the position as regards nut prices here was the same as in Jeram. A condition of almost general indebtedness is understood to exist and copra production by the small-holder has not yet been inaugurated. The nut prices are now approximately 1.2 cents for "tied" and 1.5 cents for "free" sellers respectively, while the dry low-grade copra of the middleman producer is valued at only \$4.65 per picul, equivalent to \$4.20 for undried or "wet" low grade copra.

Statement to illustrate the improved financial circumstances of the Small-holder who makes copra.

Basis: "Sundried copra = \$6.75 per picul (Singapore).

Note: The Singapore copra prices in September 1930 and February 1932 are comparable, but local nut prices have since improved as a result of competition.

Estimated nett annual income	By Nut Sale.				By Copra Manufacture.			By other sources
	To middleman producer.			To Javanese	Using own nuts and making on own kiln		Using own & bought nuts	
	Sep. 1930.		Feb. 1932.	Feb. 1932.				
	If in debt	If free	If free	By contributors	Bad Copra	Good Copra	Good Copra	
	₹	₹	₹	₹	₹	₹	₹	₹
Javanese owner of mature 20 acre holding	—	590	—	—	710	935	1,195	—
Malayan owner of good 6 acre holding	150	210	285	300	310	355	—	—
Dealer in good dry copra above (commission)	—	—	—	—	—	—	—	324
Cooly, employed by Javanese above (wages)	—	—	—	—	—	—	—	163

Conclusions.

- (1) It has been shown that increased education of Malay small-holders in improved methods of copra production where conditions are favourable can succeed.
- (2) It is essential that capital must be forthcoming either from a single individual or from a small group of neighbours who are prepared to work together.
- (3) Only dry copra of good quality must be manufactured so that a sufficient margin of additional profit is available to put the producer in an unassailable position.
- (4) If the kiln has a single owner, he must be fair-dealing and his contributors should preferably be men who are free of debt and are hence unassailable.
- (5) Finally, a satisfactory price must be obtained for the improved copra. If a local dealer willing to pay a fair price is not to be found, it will be necessary to go further and organise transport of the copra to larger buyers.

Recommendations for the Construction of Smoke Kilns for use by Small-holders.

General.

The copra-drying platform should be at least 6 feet from the fires, while the fires and the copra should be completely shielded.

An economic small unit would therefore be a closed chamber 6 feet high, 6 feet long and 6 feet wide, entirely surrounded by a large attap shed sufficiently large to provide storage space for shell fuel, finished copra and working room.

Consideration of Size.

If all the sides of such a square kiln are extended equally, the capital cost per square foot of drying space decreases thus:—

<i>Kiln</i>	<i>Drying Area</i>	<i>Length of 6 feet walls</i>	<i>Relative cost per sq. foot of drying area</i>
6 feet x 6 feet x 6 feet	36 sq. feet	24 feet	.666
12 feet x 12 feet x 6 feet	144 sq. feet	48 feet	.333
15 feet x 15 feet x 6 feet	225 sq. feet	60 feet	.266

If two of the sides are extended so as to give an oblong kiln, the relative cost per square foot of drying area increases. The advantage of greater convenience, however, outweighs this consideration, in the case of large estate kilns.

Since conditions in small holdings normally do not allow of large scale manufacture, only two types of kiln need be considered—

- (A) 6 feet x 6 feet x 6 feet or nearest.
- (B) 12 feet x 12 feet x 6 feet.

Capacity.

The former (A) is intended for individual small holdings from 6 acres up to 20 acres in extent; the latter for larger small holdings, or for use by groups of contributory small holdings. Allowing for fluctuations in crop, which may frequently vary as widely as 3 : 1 or even more, and for careful production, by which only a thin bed of copra is dried at a time, kiln B should easily be able to cope with the crop from 80 mature acres of good yielding coconuts.

The normal provision on estates lies between $\frac{3}{4}$ square foot of drying area per acre (which is much too little) and 2 square feet per acre (which is correct), so that Kiln B has a recommended outside limit of about 100 acres. At 20 nuts per square foot, its correct working load is 2,800 nuts every four days.

Details of Construction of the Kiln.

1. Especially if the kiln is to be in continuous use, the walls must be designed to retain heat and radiate it uniformly. Hence galvanised iron and attap are unsatisfactory materials for the kiln walls.

2. With kiln B in discontinuous operation, a 9 inch brick wall was decided upon, but for larger kilns in regular and continuous use 15 inch walls, although more costly, will retain more heat and so lead to greater clean heat utilisation and more uniform drying.

3. Walls constructed of heavy alluvial clay have not proved entirely satisfactory, since unless constant attention is given to re-luting the cracks as they appear, the excessive shrinkage of clay will lead to the ultimate collapse of the walls.

Where, however, the local clay is of lighter texture and contains a suitable proportion of sand (e.g. Kuala Langat District), clay may be rammed on to a core of woven sticks and if planks are used to shape and build up the walls, a satisfactory kiln will result.

Normally, binding agents are necessary to prevent the formation of large cracks, while a mixture composed of about 80 per cent. heavy clay, 10 per cent. sand, and 10 per cent. local lime has, after puddling together, resulted in a most solid wall.

Recommended binding agents are—long dry “lallang” grass, string or broken rope, and if the mass is well rammed, padi husk. The core of the wall may be composed of platted sticks, light expanded metal, chicken wire or stacked coconut husks.

The materials to be recommended in any one district naturally depend on local conditions, but undoubtedly brick construction will give more permanent service and is to be recommended wherever its use is possible.

4. Trenches 9 inches deep, excavated in the earth of the fire-pit have been



Fig. 1. A Paivutua Cupra Kuni
Dimensions: 6' x 6' x 3' high
View: Steps in foreground

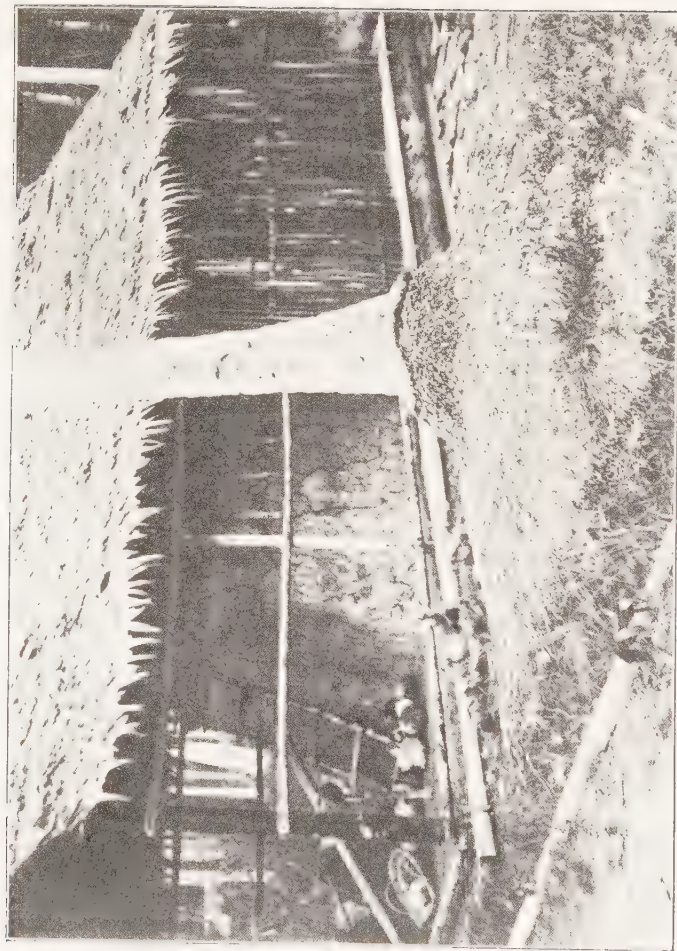


Plate 2.—CLAY COPRA KILN

The enclosing shed has been opened to show the kiln. *Note.* This kiln has been in use two months and large cracks may be seen.

found helpful in arranging and shielding the shell fires from draughts.

5. It has been stated that the large kiln may not always be working to full capacity, and it is therefore essential that provision should be made against the eventuality of lean harvests by providing a cross-wall in the fire pit to extend from the ground up to the copra platform so that, if desired, only one half of the kiln may be used without any detriment to the copra by reason of irregular drying.

Uprights in the fire-pit should be of brick, angle iron, iron pipe or stout timber protected by tin plates, otherwise there is a danger of fire.

6. Iron as a material of construction for the copra platform is good, but will account for quite half of the total capital expenditure. Nibong or bamboo slats are not so permanent nor yet so tidy, and an alternative of wooden laths screwed to stout cross beams is to be tried. In all cases it is strongly recommended that local scrap yards should be inspected before the purchase of any steel work.

7. The copra should be shielded from draughts by means of a brickwork rim, 15 inches high, surrounding the copra platform. Alternatives are planks, baulks of timber, or flattened galvanised iron, reinforced by a wooden frame-work. These have the advantage of portability.

8. A shed to enclose the kiln proper is necessary to screen the kiln from draughts, so that humid air over the copra is kept warm and is unable to deposit its moisture on the topmost copra. By maintaining warm conditions it also increases the heat efficiency, but there must be free escape through the roof for the saturated air, otherwise stagnant conditions will arise, and drying may even be locally suspended to the detriment of the copra.

9. The shed may also serve as a store for copra, for shell fuel and for unripe nuts which need to be matured. Shutters should be provided if the shed is too dark and secure doors are advisable.

10. If a high piece of land is chosen, an excavation some 1 to 2 feet below ground level will bring the drying platform conveniently nearer the ground and will also provide better heat retention and radiation. Alternatively, the ground surrounding the kiln may be built up some 2 feet.

11. No ventilation holes need be made in the walls of the fire pit, but some provision is advisable for smoke escape. In Kiln B the height of the girders allowed for a 2 inch gap between the copra and the top of the brick work. Alternatively, a small gap can be left on the kiln platform between the copra and the copra screens.

Advice on Copra Production.

1. As far as possible, only fully brown nuts should be harvested.
2. If some unripe nuts have to be collected to avoid theft, they should be sorted out and left to mature for one month.

3. The nuts should not be split open until the very last moment prior to drying. If, owing to local conditions, split nuts have been carried to the kiln from the field in sacks there must be as little delay as possible in applying heat.

4. If there is an amply supply of shell fuel, use only the halves which are clean and free from husk. Mature shell is preferable to immature shell, and the supply should always be kept in a dry place.

5. During fine weather, copra should always be partially sundried before kiln drying. If rain threatens or the sky is overcast, the copra should on no account be laid out on the ground or the concrete barbecue, but should be put at once on the kiln.

6. During certain months of the year, notably March, September, October and November, it is advisable to suspend all pre-drying in the sun completely. At other times, should the sky become overcast, very little drying takes place.

7. In certain districts, middleman-producers sun-dry their copra for 5 days after kiln drying. Generally, this is a most unsatisfactory practice, though in good weather excellent copra can often be obtained.

8. The only sound procedure is to sun-dry for 8 hours (one day). This will remove a quarter of the total moisture, and will dry the surface so that husk and smoke cannot subsequently adhere. Care must be taken that all the halves are carefully drained of milk and are laid out face upwards.

9. The same evening, the copra must be placed on the kiln and a shell fire started.

10. A fire with 200 half shells arranged in pairs in a continuous line in the form of a "U" will in a 12 feet x 6 feet fire pit last 10 hours, and will not normally go out before it has completely burnt out.

11. For the following two days, two such fires may be lit at opposite ends of the kiln every 10 hours.

12. On the morning of the fourth day after sun-drying, a single fire is again advisable, otherwise there is a danger of the copra becoming discoloured or burnt.

13. The sacks used for copra transport and the store itself should be kept clean and periodically inspected for insects.

(A) Do not sell under-dried or "wet" copra.

(B) Do not allow copra containing any excess moisture to remain at cold shade temperatures for more than one hour.

The Quality of Copra required by the Oil Mills in the District.

Where, as in Kuala Selangor, a different price is paid for each lot of copra, the following points are taken into consideration by dealers (1) dryness, (2) absence of immature pieces of copra, (3) absence of smoke or colour.

Details of Kilns.

DETAILS.	SCHEME 1.	SCHEME 2.	POSSIBLE ALTERNATIVES.
SIZE :			
Size	6 ft x 12 ft x 6 ft high	6 ft x 4 ft x 6 ft high	Large Estate kiln : 50' x 12' x 7' high
Drying area	144 square feet	24 square feet	600 square feet
Equivalent acreage	72 to 144	12 to 24	300-600
Recommended acreage	100	15	400.
CAPACITY :			
Peak capacity	4,320 nuts	720 nuts	21,000 nuts (as normally worked but overloaded)
Average capacity	2,880 nuts	480 nuts	50 Tons.
Peak output per month	11 tons	2 tons	
SHED :			
Roof	Attap	Attap	Tiles (Ceylon), Galvanised Iron, Slate
Sides	Rough Planks	Attap	Planks, Brick, Galvanised Iron.
Uprights	Poles	Poles	Iron Stanchions, Angle Iron, Square Timber, Brick, Piping.
KILN :			
Main walls	9 inches Brick	Clay and whole husk.	Clay mixtures, Galvanised Iron, Attap, Earth Pit (Philippines).
Cross walls	9 inches Brick	None	Galvanised iron sheeting
Copra platform	Thin iron rod	Nilong slats	Expanded metal, Perforated iron sheeting, laths, bamboo.
Copra screen	Galvanised iron (flattened)	Coconut trunks	Brick Planks, Attap.
Beams	Light Girders	Coconut trunks	Heavy Girders, Scrap rod, Scrap rail, Angle iron, Timber.
Uprights	4 inches iron piping	Coconut trunks	Poles, Brick, Iron stanchions, Timber.
Doors	Galvanised iron (flattened and strengthened)	Boarded	
Misc. :			
Estimated life	20 years	3 years	
Estimated cost	\$200.00	\$50.00	
Depreciation, upkeep and renewal cost	\$31.00 p.a.	\$20.00 p.a.	

Moisture.

The moisture content of small-holders' copra, as marketed, varies between 6 and 20 per cent. so that, after allowing for the excessive moisture content of "wet" copra, one is able to calculate that the basic worth of dry low grade copra is \$5.00 per picul and that the true discount for poor quality or anticipated deterioration is thus 75 cents a picul.

All copra has to be sun-dried on concrete before milling and is dried to 5 per cent. moisture otherwise it would clog the machinery. The copra is then crisp and "musical", and emits a characteristic squeal when pressed.

Nothing is really gained by including an excessive quantity of moisture, owing to the graded system of discounts for excess moisture, unless a dealer is careless in his buying. Furthermore, originally wet "white" copra will generally arrive at the mills in a deteriorated condition.

Immature Copra.

Exception is always taken and a penalty inflicted by the oil miller if immature pieces of copra are present in any quantity. Such copra is rubbery and as a result, the extraction efficiency is low.

Smoke and Colour.

Smoke and colour in the original copra produces colour, smell and taste in the resulting oil and in the by-product oil cake. The oil when extracted, cannot therefore be classified as No. 1 quality and the residual oil cake may be rendered unpalatable and so unsaleable, except perhaps at a severe discount.

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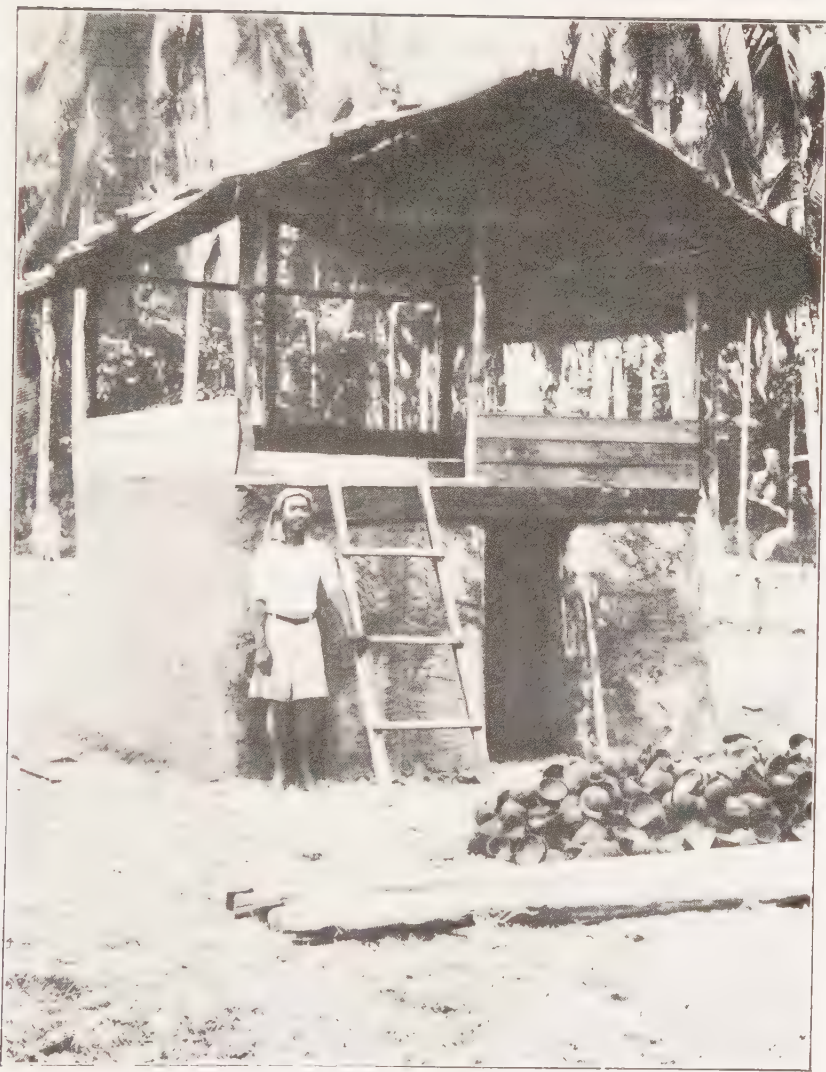
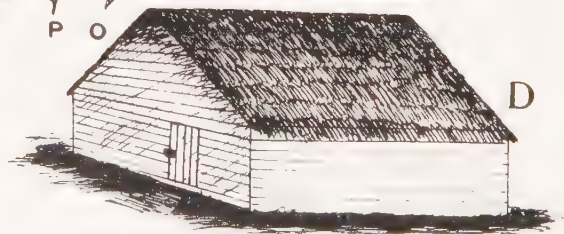
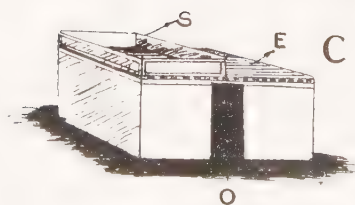
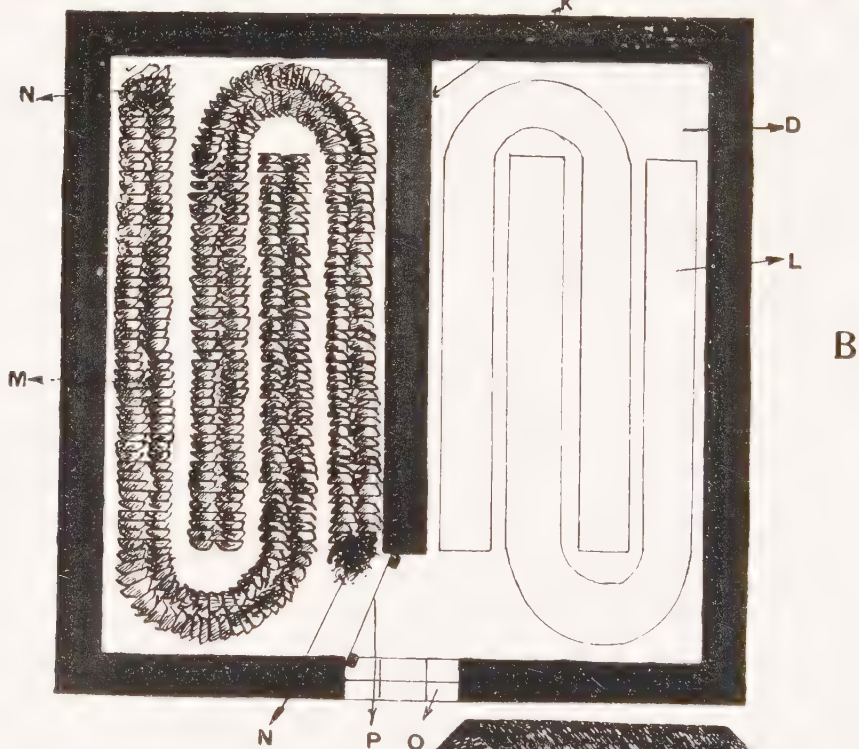
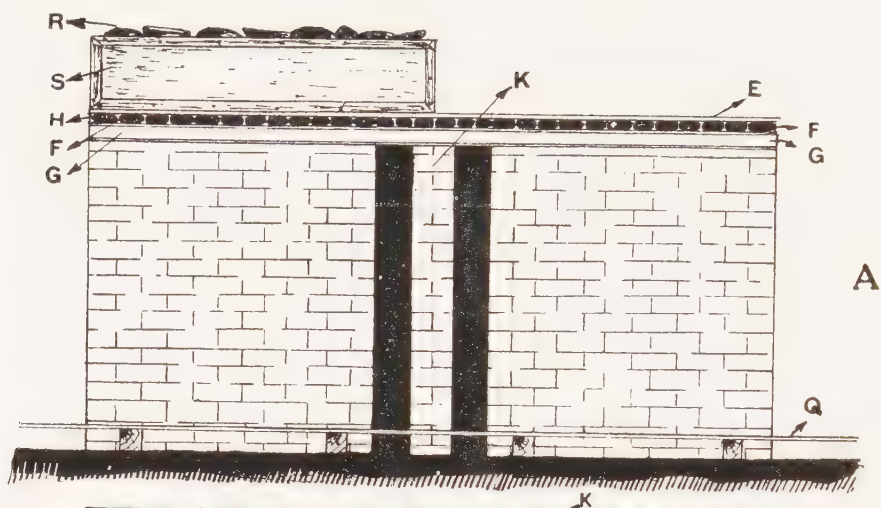


Plate 3.—CLAY MIXTURE COPRA KILN
The attap house to enclose the kiln has yet to be erected.
Note. Copra shields and excellence of construction.



PLAN OF BRICK COPRA KILN
Dimensions : 12' x 12' x 6' high.

Key
To Diagram of Brick Kiln.

- A. Front view of kiln.
- B. Cross Section of kiln.
- C. View of kiln.
- D. View of attap and plank shed housing the kiln, and providing also a store for unripe nuts, dry copra, shell fuel and bags.
- (e) Copra platform of flat iron rods.
- (f) Light steel rail.
- (g) Light girder.
- (h) 2" smoke escape.
- (j) External walls (9").
- (k) Brick partition in fire pit.
- (l) 9" earth trench for shell fires.
- (m) Arrangement of continous shell fires.
- (n) Fires.
- (o) Entrance to fire-pit.
- (p) Door to close section of kiln in use.
- (q) Plank floor.
- (r) Copra.
- (s) Copra shield of reinforced galvanised iron.

COPRA DETERIORATION

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The following abstract of an article, entitled "The depreciation of prepared copra by moulds and insects" by F. R. Passmore which appeared in the Bulletin of the Imperial Institute, Vol. XXIX (1931), No. 2 provides a useful basis for a consideration of copra deterioration.

The Opinions of Manufacturers and Shippers in England.

Preliminary enquiries have been made in England to ascertain the extent of the loss to the industry occasioned by insect attack and by the development of mould growths on copra, and to determine whether organised investigations to eliminate these features are justified.

Manufacturers in England are generally indifferent to the investigations, since they buy on the basis of the quantity and quality of the copra as received, so that the material losses resulting from deterioration and the expense of refining to eliminate free fatty acids, smell and discoloration, are borne by others. Furthermore, they do not keep large stocks of copra, which might deteriorate in storage.

Manufacturers of coconut oil do not consider that mould growth on copra is helpful to the expression or extraction of coconut oil. British manufacturers of edible coconut oil require copra that is clean and dry, with a high oil content and a low acidity. When coconut oil is used for low-grade soap making, a high oil content is the only factor demanded.

Representatives of firms engaged in shipping very low grade copra, consider that efforts to improve such copra are worth while, provided no great expense is entailed. Even they are covered against actual loss of weight in shipment by arrangement with the seller in the producing country.

Cases of inferior quality can always be traced to causes in the country of origin—except in such rare instances as "sea damaged".

The prices of the different grades of copra are based upon the average standard exported from each country of origin, and the following is a list in order of the relative market value of each at the time of the inquiry:—

Standard Copra Grades.

- | | | | |
|---------------|---------------|--------------|------------------------|
| 1. F.M.G.W.S. | Malabar. | 9. F.M.S. | Mozambique Plantation. |
| 2. F.M.S. | Ceylon. | 10. F.M. Hot | |
| 3. F.M.S. | Seychelles. | Air Dried. | Samoan Plantation. |
| 4. F.M.S. | Mauritius. | | (Crown Estates) |
| 5. F.M.S. | West Indian. | 11. F.M.S. | Java. |
| 6. F.M.S. | Trinidad. | 12. F.M.S. | Straits. |
| 7. F.M.S. | Demarara. | 13. F.M.S. | Dutch East Indies. |
| 8. F.M.S. | West African. | 14. F.M. | Galle. |

15. F.M. Hot		25. F.M.S.	Papuan.
Air Dried.	Samoan Plantation.	26. F.M.S.	South Sea.
16. F.M.S.	Samoan Plantation.	27. F.M.	Straits.
17. F.M.S.		28. F.M. Mixed.	Dutch East Indies.
Standard.	Samoan (new grade).	29. F.M.S.	Zanzibar.
18. F.M.S.	Mozambique.	30. F.M.S.	Philippine.
19. F.M. Hot		31. F.M.	Philippine.
Air Dried.	Rabaul Plantation.	32. F.M.S.	
20. F.M.S.	Rabaul Plantation.	Trade.	South Sea.
21. F.M.S.	Papuan Plantation.	33. F.M. Mixed.	South Sea.
22. F.M.S.	South Sea Plantation.	34. F.M.	
23. F.M.S.	Samoan.	Kiln-dried.	South Sea.
24. F.M.S.	Rabaul.	35. F.M.	Zanzibar.
F.M.G.W.S.	means	Fair Merchantable Good White Sun-dried.	
F.M.S.	"	Fair Merchantable Sun-dried.	
F.M.	"	Fair Merchantable (i.e. not necessarily sun-dried, therefore mainly kiln-dried).	
F.M. Mixed	"	Fair Merchantable Mixed (i.e. sun-dried and kiln-dried proportionately, but not necessarily 50 : 50).	

The term "Sundried" is merely an expression of quality, and does not necessarily indicate the method of preparation.

The Condition in which Copra Arrives in England.

Since cargoes loaded in a damp and mouldy condition have dried out sufficiently before reaching Europe to render the moulds inactive, it is extremely difficult to determine the relative proportion in which different moulds attack copra by an examination of the product on arrival.

Contemporary and subsequent insect and mite infestation destroys a large amount of the dried mycelium, while sweating, drying out and rough handling of the product, reduce mould colonies to a mere discoloration of the produce.

Judging from the hordes of insects seen on infested shipments, the loss of copra by actual consumption must be considerable, and the production of "dust" by these insects is a common cause of arbitration for adjustment of price.

The three most prevalent insects found in imported copra during the survey were:—

- (1) *Necrobia rufipes*
- (2) *Oryzaephilus (Sitonus) mercator*
- (3) *Tribolium castaneum*.

In order to combat *Necrobia rufipes* which is the most prevalent pest encountered on arrival, one firm of importers proposes to institute regular fumigation of copra shipments with sulphur dioxide prior to their despatch to Europe.

The Relations of Producers, Shippers and Manufacturers.

Copra as received in England has dried out *en route*, and accordingly arrives as a stable and reliable, if deteriorated, product. Since buyers in England pay only for what they receive and shippers are covered against possible losses due to further depreciation *en route*, it is only to be expected that they will not be interested in investigations which appear to be of no pecuniary importance to themselves.

The losses due to deterioration in transit, which are thereby indirectly but wholly borne by producers, are occasioned by (a) actual loss of weight, and (b) loss of quality. The penalties for the latter may take the form of price discrimination according to the country of origin, or if the quality has fallen below the recognised standard for that country, arbitration to determine what penalty be inflicted becomes necessary.

The average prices of leading "marks" during 1931 were as follows :

				£.	s.	d.	
Malabar F.M.G.W.S.	...	...	...	15	4	0	per ton
Ceylon F.M.S.	...	...	...	14	14	0	" "
Java F.M.S.	...	...	...	13	19	0	" "
Straits F.M.S.	...	...	...	13	14	0	" "
South Seas F.M.S.	...	...	...	12	19	0	" "
Philippine F.M.S.	...	...	...	12	19	0	" "

It will be seen how severe is this price discrimination.

The Justification for Price Discrimination.

An explanation of the reason for the low price for low grade copra would be of interest to producers. As stated by Passmore, if the copra is of a particularly low quality, the utilisation of the derived oil is limited to low-grade soap-making but, in addition, if the by-product oil cake has a smoky and rancid smell, dark colour, and sour taste, it may be quite unsuitable for use as cattle food.

If the copra is of somewhat better quality, the derived oil will still need to be refined before it can be used for the manufacture of white toilet soaps and margarine, and price discrimination will then be in proportion to the cost of refining. This is made up of the normal operating charges, the cost of the materials used which is variable and the loss of neutral oil during the process which also varies.

During the process of refining, the free acidity is removed, by the addition of alkali, in the form of a dirty soap stock, sometimes difficult to dispose of from edible oil factories. This therefore limits the market for copra of intermediate quality to those factories where it is possible to utilise or dispose of such stock.

Brittle copra is preferred by manufacturers to soft rubbery copra, since it is easily broken and ground, a higher oil extraction is possible, and stoppages due to clogging in the silos and hoppers are less frequent. While oil is about four times more valuable than cattle cake in Europe, the copra is to be preferred which will, following a standard procedure, yield the most free oil and leave the same percentage of oil in the residual cake after each pressing.

The Causes of Copra Deterioration by Moulds and Insects.

It is obvious from the observations of Passmore and other workers whom he quotes, that the fundamental causes of the deterioration of a shipment of

copra are to be found in the country of origin. Careless methods of preparation, insufficient drying, the practice of blending poor with good copra before shipment and not the climatic conditions are the factors responsible for subsequent deterioration. If the copra is well-dried, the reabsorption of moisture during damp weather is not serious and under the worst conditions in Malaya, moisture is not taken up by dry copra beyond 8 per cent.

Investigations in Malaya and in Ceylon indicate that wet coconut meat and partially dried copra are always liable to serious bacterial attack unless certain precautions are taken, particularly during manufacture. The importance of this feature does not appear to be sufficiently emphasised by Walker. If bacterial attack is allowed to develop, low-grade copra will always result, and the seriousness of subsequent mould development and insect attack would appear to depend upon the extent to which the cell structure is initially broken down by bacteria.

The first symptom is a pale yellow gummy slime to which dirt and pieces of husk readily adhere while smoke deposition during the process of drying is frequently also severe. If, at this stage, drying is carried to completion, the danger of further depreciation is arrested, but it will be impossible to obtain white copra, and the colour of the resulting product will range between pale yellow and dark reddish brown according to the degree of bacterial penetration. Such discoloration is exceedingly common and is frequently distinguishable from actual burning, which is comparatively rare, only by smell.

If drying does not proceed continuously to completion, serious attack by penetrating moulds will ultimately set in and continued unsatisfactory conditions will produce a black, slimy wet, matted product owing to moisture of decomposition. Such copra may be redried before shipment either by exposure to the air or by admixture with good copra, while, during shipment, further drying will ensue owing to ventilation of the holds.

The conclusion of De Fremery* that cell degeneration by bacteria is a factor of great importance as regards the susceptibility of copra to insect attack has been amply confirmed both in Malaya and in Ceylon, and it has been observed that copra which has deteriorated or softened has a considerably greater attraction for copra-consuming insects than hard well-dried copra.

Observations on Specific Micro-organisms and Copra Insects.

Investigations have been carried out with two species of bacilli which are associated with the slime found on the white face of wet coconut meat during the early stages of the drying process.

They may be found either separately or associated, one being a short rod, averaging 3/1000 mms. in length, and the other, ranging between 6/1000 and 9/1000 mms. in length. When they first appear, the colonies of the two bacilli are distinguishable in that the former produce smooth, shiny, circular, colonies and the latter show a rougher surface and a more irregular type of colony.

* *Review of Applied Entomology*, April 1930, De Fremery.

The most favourable conditions for bacterial attack are provided when wet or half-dried coconut meat is exposed to cold humid conditions for long periods. The temperature above which the bacteria cannot live has not yet been determined.

The short rod appears to cause the initial deterioration of wet coconut meat and ultimately produces the marked corrosion and pitting together with the surface slime, which is found on copra where careless methods of preparation are followed. The long rod may be found both on wet coconut meat and on half-dried copra containing an average moisture content in excess of approximately 20 per cent. It is of course, the surface condition of the copra that is the deciding factor and it is accordingly not possible to be more specific. It would appear that this bacterium is of secondary consequence in breaking down the cell structure and initiating deterioration.

After the slime has been in evidence one or two days and has been allowed to become general, attack by *Carpophilus dimidiatus* is very marked, and this insect has even been found on the copra drying platform of a badly designed kiln. Subsequently, if unsatisfactory conditions are maintained, penetrating moulds appear and infestation by this insect becomes still more severe, particularly after invasion by the mould, *Aspergillus flavus*.

Necrobia rufipes known to the trade as the "copra bug" would appear to be essentially a warehousing pest which is introduced into estate copra stores through the agency of returned sacks. Wet mouldy copra appears to be much more attractive to this beetle than well-prepared dry copra.

The following rice pests are usually to be found in copra contained in old rice bags or kept in the neighbourhood of a rice store room :—*Silvanus advena*, *Silvanus surinamensis*, *Ephestia cautella*, and *Tribolium castaneum*. The use of old rice bags for transporting copra, unless they are carefully cleaned beforehand, will lead to insect infestation.*

Observations in Malaya indicate that serious attack by mites usually commences when the mould mycelium appears to be no longer active and, as observed by Passmore, they destroy the web, break down small irregular pieces of copra and so are largely responsible for the production of "dust".

Efforts to combat the nuisance caused by copra pests emanating from warehouses adjoining dwelling houses have actually been made in Malaya, involving fumigation of copra stocks, but the practice has been discontinued.

The following is a list of the more important micro-organisms to be found during the production of copra in Malaya :—

A. *On wet coconut meat*—Moisture : about 50 per cent.

On drying coconut meat—Moisture : 20—50 per cent.

Initially :

(1) Bacteria (penetrating)

* A fuller report is available. See *Malayan Agricultural Journal*, July 1931, Corbett.

Subsequently :

- (2) Yeasts (occasional)
- (3) *Aspergillus flavus* (penetrating) Yellow-green mould.
- (4) *Aspergillus niger* (penetrating) Black mould.
- (5) *Rhizopus nigricans* (penetrating) White mould which later becomes greyish black.

No. (5) is most in evidence when coconut meat is kept under conditions which do not permit of free air movement. No. (2) has up to now been found to be only of secondary importance.

B. *On half-dried copra*—Moisture : 12—20 per cent. (3), (4), and (5) above.

C. *On insufficiently dried copra*—Moisture : 8—12 per cent.

- (6) *Glaucus spp.* (superficial)
 - (7) *Aspergillus tamarii* (penetrating)
 - (8) Occasional moulds of lesser importance.
- D. *On dry copra*—Moisture : less than 8 per cent.
- (9) *Aspergillus cinnamomeus* (?) (superficial) Cinnamon coloured mould.
 - (10) *Penicillium glaucum* (superficial) Green mould.
 - (11) *A. Glaucus spp.* (occasional) Green moulds.

The Prevention of Bacterial Attack on Copra.

It is absolutely essential that bacterial attack on wet coconut meat or on half-dried copra should be inhibited if dirt and smoke adhesion, severe discoloration and attack by penetrating moulds and by copra consuming insects are to be eliminated. In practice, this is effected by the application of hot air before the bacterial attack has had time to develop.

Thus, it is essential to make the time between splitting the nuts open and applying heat as short as possible. It is not, however, sufficient merely to place the half nuts on the drying platform of the kiln without delay. The kiln should be already warmed up and it should be so designed that none of the copra will be exposed to draughts of cold air. Furthermore, it should not be so overloaded that cold and humid conditions can obtain on the top surface of the bed of copra. These may be caused either by lack of free air movement through the bed of copra or to overloading the rising hot air with moisture and incidentally chilling it in the process.

Unless precautions are taken therefore, conditions favourable to bacterial attack may exist for a very long time indeed.

The Time Factor.

Practical observation has shewn that the time factor depends on the humidity and the temperature of the air surrounding the copra.

A relative humidity of over 80 per cent. at any temperature under 30°C provides the necessary environment and under such conditions a bacterial slime

may commence to show in 4 hours, while in 8 hours, the copra will be irretrievably spoilt. Attack by mould (3), (4) and (5), above, follows within 48 hours bacterial sliming unless the moisture content is reduced to below 20 per cent. within this period.

The time factor for superficial moulds varies with the conditions under which the finished copra is stored. Again, the atmospheric humidity is the controlling factor and where the stores are kept warm, dry and ventilated, there need be no mould development whatever. Under cold humid conditions of storage, however, superficial moulds may appear within a week. Such moulds, although unsightly, do not depreciate the value of the copra.

Conclusions.

If copra is carefully prepared and satisfactorily dried, a clean crisp white product is obtained, while subsequently only a superficial growth of mould will develop.

Furthermore, although insects may be found on such copra, if clean conditions of warehousing are observed, the attack is not serious. Crisp undeteriorated copra is preferred by crushers, and countries which export such copra in quantity receive a favourable price discrimination.

It has been observed by Grist* that no advantage is likely to be obtained by a single producer who succeeds in improving the quality of his individual output while his neighbours continue to keep the average standard low. At the same time, all producers should endeavour to improve the quality of their copra, since a good product is easily obtainable at the inconsiderable expense of slight alterations to kilns and process. If such a progressive attitude is generally adopted, and a general improvement in quality results, a favourable price discrimination in Europe may reasonably be expected.

* *Malayan Agricultural Journal*, February 1930, Grist, D. H.

THE REMOVAL OF PLANT NUTRIENTS IN COCONUT CULTIVATION

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Introductory.

The investigation regarding the amounts of plant nutrients removed from the soil by oil palms under cultivation, an account of which was published in this Journal (1), has been extended to coconuts.

Although, as pointed out in that article, chemical analysis of a plant cannot solely be relied upon as an accurate guide to its requirements from the point of view of nutrients, the additional work was carried out in order to have on record comparative figure for coconuts, especially as manuring experiments with both crops are in progress. In this connection, attention is drawn to the article compiled from Departmental records and published in this Journal (2).

Further, it is considered that the results are of special interest in view of the fact that the soils on the estates selected all belong to the heavy coastal type and are relatively rich in plant nutrients, compared with, for example, the light coconut soils of Ceylon or South India. The figures should therefore give some indication of the order of the amounts of the plant nutrients that are likely to be removed under good soil conditions.

Collection and Analysis of Samples.

Samples of leaves, inflorescences and nuts were collected from 6 estates on the West Coast. The palms, from which the constituents were selected, were mature, varying in age from 16 to 30 years.

With regard to the actual constituents, fully developed leaves were taken; that is to say, the lowest hanging green leaf on a palm was cut. In this connection it may be mentioned that owing to the difficulty of severing the leaf close to the trunk, the proportion of midrib may be slightly on the low side; it is not considered, however, that the error is sufficient to alter appreciably the figures given for the average composition of a leaf.

The inflorescences selected were those on which one or possibly two ripe nuts were still hanging, while only ripe nuts were taken for analysis.

Owing to the impossibility of direct sampling, the particular constituent of the palm was separated into its component parts prior to analysis, the proportions of the components being also determined in order to enable the composition of the original constituent to be calculated.

The following table shows the details of separation in each case:—

Palm Constituent.

Leaf
Inflorescence
Nut

Components.

Petiole, Leaflet.
Spathe, Spadix.
Husk, Shell, Meat, Milk.

As regards the analysis of the components, determinations of moisture, nitrogen, phosphate, potash, calcium and magnesium were made, the last two elements being added in view of the important part which they are considered to play in plant growth.

Owing to the large number of separate estimations involved, an attempt was made to accelerate the rate of working by the substitution of volumetric and colorimetric methods for the more laborious gravimetric processes. Such methods were considered sufficiently accurate for the purpose of the investigation, especially in view of the fact that with the relatively small number of samples being analysed, the results could only be relied upon as far as indicating the order of the amount of a particular plant nutrient.

The following is a brief outline of the procedure adopted. In this connection it may be mentioned that the methods to be described for the mineral constituents are those which have been elaborated in the Soils Division of the Department for use in such analyses :—

- (a) Moisture was determined by drying to constant weight at 100°C.
- (b) Nitrogen was estimated by the Kjeldahl method.
- (c) Phosphate was determined by the modification of the Denigès method described in this Journal (3). Occasional checks were made by the usual gravimetric method with good results.
- (d) Potassium was determined by the sodium cobalti-nitrite method described in this Journal (4).
- (e) Calcium was precipitated as oxalate from the solution of the ash in hydrochloric acid after removal of silica, iron and aluminium by appropriate methods. The calcium oxalate was filtered off, treated with dilute sulphuric acid and the oxalic acid titrated with standard potassium permanganate.
- (f) The filtrate from the calcium oxalate was used for the determination of magnesium. The solution was treated with sodium ammonium phosphate (microcosmic salt), the precipitate filtered off and treated with acetic acid in which the magnesium phosphate complex is soluble. The phosphate content of the acid solution was estimated according to the modification of the Denigès method referred to previously, the amount of magnesium being calculated from the amount of phosphate.

Results of Analysis.

The results of analysis of the various components and the calculated composition of the constituents of the palms are shown in Tables I, II and III on pages 360 and 361. In order to make the Tables as concise as possible only the average, maximum and minimum figures are given.

In this connection it may be mentioned that the results are based on the analysis of 6 samples of leaves, 7 samples of inflorescences and 8 samples of nuts.

TABLE I.

Analysis of Component Parts and Calculated Composition of Leaves.

(Results expressed in parts per cent.)

Details	Nutrient	Average	Maximum	Minimum
Petiole.	Nitrogen	0.097	0.127	0.066
Proportion of Leaf	Phosphate as P_2O_5	0.095	0.194	0.047
64.3 per cent.	Potash as K_2O	0.318	0.639	0.151
Average moisture content	Calcium as CaO	0.130	0.223	0.022
68.1 per cent.	Magnesium as MgO	0.162	0.245	0.033
Leaflet.	Nitrogen	0.596	0.778	0.508
Proportion of Leaf	Phosphate as P_2O_5	0.134	0.162	0.115
35.7 per cent.	Potash as K_2O	0.286	0.487	0.123
Average moisture content	Calcium as CaO	0.094	0.150	0.036
49.8 per cent.	Magnesium as MgO	0.187	0.414	0.024
Leaf. (calculated)	Nitrogen	0.275	0.359	0.224
Average moisture content	Phosphate as P_2O_5	0.109	0.183	0.071
61.6 per cent.	Potash as K_2O	0.297	0.584	0.140
	Calcium as CaO	0.117	0.197	0.027
	Magnesium as MgO	0.181	0.305	0.030

TABLE II.

Analysis of Component Parts and Calculated Composition of

Inflorescences.

(Results expressed in parts per cent.)

Details	Nutrient	Average	Maximum	Minimum
Spathe.	Nitrogen	0.140	0.168	0.112
Proportion of Inflorescence	Phosphate as P_2O_5	0.082	0.104	0.060
51.3 per cent.	Potash as K_2O	0.828	1.233	0.547
Average moisture content	Calcium as CaO	0.041	0.074	0.024
63.7 per cent.	Magnesium as MgO	0.157	0.251	0.064
Spadix.	Nitrogen	0.249	0.276	0.226
Proportion of Inflorescence	Phosphate as P_2O_5	0.084	0.104	0.050
48.7 per cent.	Potash as K_2O	1.113	1.574	0.748
Average moisture content	Calcium as CaO	0.067	0.117	0.027
59.4 per cent.	Magnesium as MgO	0.169	0.196	0.133
Inflorescence. (calculated)	Nitrogen	0.193	0.211	0.169
Average moisture content	Phosphate as P_2O_5	0.083	0.104	0.055
61.6 per cent.	Potash as K_2O	0.967	1.399	0.645
	Calcium as CaO	0.054	0.095	0.025
	Magnesium as MgO	0.163	0.224	0.098

TABLE III.

Analysis of Component Parts and Calculated Composition of Nuts.

(Results expressed in parts per cent.)

Details	Nutrient	Average	Maximum	Minimum
Husk.	Nitrogen	0.193	0.220	0.153
Proportion of nut	Phosphate as P_2O_5	0.092	0.105	0.074
31.7 per cent.	Potash as K_2O	1.241	1.471	1.005
Average moisture content	Calcium as CaO	0.043	0.081	0.026
31.0 per cent.	Magnesium as MgO	0.113	0.167	0.070
Shell.	Nitrogen	0.081	0.090	0.073
Proportion of nut	Phosphate as P_2O_5	0.035	0.042	0.026
16.5 per cent.	Potash as K_2O	0.364	0.479	0.277
Average moisture content	Calcium as CaO	0.009	0.013	0.006
20.2 per cent.	Magnesium as MgO	0.014	0.025	0.008
Meat.	Nitrogen	0.639	0.693	0.566
Proportion of nut	Phosphate as P_2O_5	0.257	0.300	0.221
29.2 per cent.	Potash as K_2O	0.488	0.605	0.434
Average moisture content	Calcium as CaO	0.002	0.003	0.001
49.3 per cent.	Magnesium as MgO	0.012	0.016	0.007
Milk.	Nitrogen	0.016	0.024	0.010
Proportion of nut	Phosphate as P_2O_5	0.024	0.029	0.021
22.6 per cent.	Potash as K_2O	0.265	0.321	0.214
	Calcium as CaO	0.010	0.019	0.003
	Magnesium as MgO	0.015	0.029	0.009
Nut. (calculated)	Nitrogen	0.265	0.292	0.228
Average moisture content	Phosphate as P_2O_5	0.115	0.134	0.097
49.3 per cent.	Potash as K_2O	0.656	0.795	0.539
	Calcium as CaO	0.018	0.033	0.010
	Magnesium as MgO	0.045	0.068	0.028

Interpretation of Results.

In order to utilise the figures and to form some idea of the total amount of plant nutrients removed during the course of a year it is necessary to know the weights of the fresh constituents for that period. These will naturally vary, being dependent, for example, on the planting distance, the yield of nuts.

Although no definite figures can be laid down, an example, based on average estate records, kindly supplied by the Economic Botanist, is given below in order to afford an indication of the total amount of plant nutrients in question.

Age of palms	Mature (16 to 30 years)
Number per acre	50
<i>Leaves.</i>	
Number removed during year	14
Average weight	17 lbs.
<i>Inflorescences.</i>	
Number removed during year	12
Average weight	2 lbs.
<i>Nuts.</i>	
Number harvested during year	60
Average weight	4 lbs.

Combining the above amounts of fresh constituents with the results of their analysis given previously the limits of the amounts of plant nutrients removed during one year would be as shown in Table IV.

TABLE IV.

Limits of Amounts of Plant Nutrients Removed per Acre per Annum.
(Mature palms planted 50 per acre.)

Details	Nutrient	Average lbs.	Maximum lbs.	Minimum lbs.
Leaves.	Nitrogen	32.5	42.5	26.5
	Phosphate as P_2O_5	13.0	22.0	8.5
	Potash as K_2O	35.5	69.5	16.5
	Calcium as CaO	14.0	23.5	3.0
	Magnesium as MgO	21.5	36.5	3.5
Inflorescences.	Nitrogen	2.5	2.5	2.0
	Phosphate as P_2O_5	1.0	1.0	0.5
	Potash as K_2O	11.5	17.0	7.5
	Calcium as CaO	0.5	1.0	0.5
	Magnesium as MgO	2.0	2.5	1.0
Nuts.	Nitrogen	32.0	35.0	27.5
	Phosphate as P_2O_5	14.0	16.0	11.5
	Potash as K_2O	78.5	95.5	64.5
	Calcium as CaO	2.0	4.0	1.0
	Magnesium as MgO	5.5	8.0	3.5
Total.	Nitrogen	67.0	80.0	56.0
	Phosphate as P_2O_5	28.0	39.0	20.0
	Potash as K_2O	125.5	182.0	88.5
	Calcium as CaO	16.5	28.5	4.5
	Magnesium as MgO	29.0	47.0	8.0

Remarks and Conclusions.

The figures in Table IV show that considerable amounts of plant nutrients are removed annually in the course of estate practice and point therefore to the necessity of returning to the soil as large a proportion as possible of the actual constituents.

In the case of leaves, inflorescences, and in some instances the husks of the nuts, this is achieved to some extent by spreading the material on the ground and allowing it to decompose gradually, the material being occasionally turned into the soil. Although this practice must undoubtedly result in a certain proportion of the mineral constituents becoming available again for the palm it is probable that most of the nitrogen will be lost.

Further, as regards the nuts, the ashes from the kiln in which the shells are used as fuel may be utilised for the sake of their mineral content by spreading the material over the ground.

Even, however, if all these measures are adopted, the application of artificial fertilisers may still be necessary if mature palms are to continue to yield good crops, since it is uncertain to what extent the plant nutrients returned in the debris are conserved in the soil and become again available for the palms.

As pointed out previously (1) it should be realised that manures may be applied for two purposes, either to replace nutrients which are being removed by the crop, thereby maintaining the supply in the soil at a desirable level, or to increase the amount of a nutrient which may originally have been present in the soil in too small a quantity to permit of maximum growth or yield.

Chemical analysis, whether of the soil or plant, cannot be relied upon as an accurate guide to the need for either type of manuring, especially in the latter case. In so far as chemical analysis may be applied as a rough guide, high content of nutrients in the plant, if combined with a low content in the soil, might indicate the need for manures supplying those nutrients, while for the second type of manuring, low content in the plant, if combined with low content in the soil, may—but not necessarily does—indicate the need for addition of nutrients. Only field manurial experiments, such as those to which attention has already been drawn, can decide this point, the figures obtained in this investigation being merely taken as an indication of the amounts that may be required in connection with the application of the fertilisers.

In conclusion, the writers wish to thank the Managers of Batu Kawan Estate, Bukit Tambun; Chersonese Estate, Kuala Kurau; Kuala Perak Estate, Bagan Datoh; Torkington Estate, Sabak Bernam; Klanang Estate, Banting; Teluk Merbau Estate, Sepang for their kindness in providing the necessary samples for analysis.

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Review.

Investigations on Coconuts and Coconut Products.

*General Series No. 8 by F. C. Cooke, A.R.C.S., B.Sc., A.M.I. Chem. E.,
published by the Department of Agriculture, S.S. & F.M.S.,
May, 1932, 99 pages, 14 illustrations, price \$1.*

This Bulletin is divided into two parts; the first contains a description of the conditions under which coconuts are grown and copra is prepared in Ceylon, while the second comprises a report on the result of copra research work in Malaya up to June 30th 1931.

It is well known that Ceylon copra is generally of a higher quality than that produced in Malaya. For its best copra, Ceylon receives a price which is 15 per cent. higher than that of Malaya, the difference at present prices being equivalent to \$0.75 per pikul.

In July 1931, the author made a comprehensive tour of the coconut districts of Ceylon with the object of determining the reason for the superiority of the copra produced there; these reasons are made clear in this Bulletin and many valuable measures of improvement in coconut cultivation and the manufacture of copra are indicated. It was found that the Ceylon coconut-growing soils are in almost every instance, lighter and more open than those of typical Malayan coconut land and that their prevailing lie is undulating rather than flat. A table is given shewing the comparison of typical soils in Ceylon, Malaya and the Philippines.

The organised growing of coconuts on an extensive scale in mountain and hilly country between 40 and 50 miles from the sea, is a remarkable feature. The water-table of Ceylon coconut soils is generally either non-existent, or so far down as to be beyond the reach of the roots. A table of comparison of the characteristics of palms on well cultivated land in Ceylon and Malaya discloses the fact of a similarity in results obtained, in spite of the great dissimilarity of the soil conditions. The importance of water movement is emphasized. The author states that "a flat land with a relatively high water table does not appear to provide the best conditions for long life and sustained yields." Experiments with artificially induced water movement on this type of soil in Malaya have shown satisfactory results, as has the practice of irrigation on sand in Ceylon. Two illustrations are given shewing the methods of planting nuts in sandy loam and in clay, which are in general practice in Ceylon. A table comparing yields of nuts obtained under different systems of planting distances, from observations on estates and small-holdings, is given. The author states that on no area visited was clean weeding practised, though grass was kept short on the majority of estates, by cattle grazing, selective weeding and slashing. Common methods of cultivation are detailed. This work, however, was found to have been considerably curtailed and even abandoned on the more open soils, owing to the

need for economy. On account of the open texture of the soils in Ceylon, drainage as practised in Malaya, was only found in exceptional cases, although the majority of estates had shallow aeration trenches of one foot square, dug every two years in alternate rows. Mounding was found to be a common practice on very hilly land where the soil was thin or poor; rock platforms, or even walls of husks being built to retain wash, or artificially added soil, green manures or fertilisers.

The shrubby types of cover crops such as *Tephrosia candida* and *Crotalaria anagyroides* were found to be chiefly favoured. These are cut back at frequent intervals and the plants themselves ploughed in every two years.

Seven pages of the Bulletin are devoted to the subject of manuring practice in Ceylon. The various more popular mixtures of artificial fertilizers are listed and the results of improved yields obtained are shewn in tables. Owing to the slump, the use of expensive artificial manures, except where absolutely essential, was being discontinued, and the author gives detailed descriptions of the methods of cattle manuring, which, owing to the large extent to which cattle are used for transport, is a very popular practice.

Under the heading of 'Copra Production in Ceylon', the author states that, "it is the practice to visit each palm once every two months. Generally one bunch of fallen nuts is picked up and one bunch of nuts is cut." Nuts fall in a green condition from palms growing in the typical open soils of Ceylon. This is the reason for the practice of nut storage, normally for a period of one month, which is practically unknown in Malaya, where fallen nuts are generally brown. The author suggests that the storage of green, fallen nuts in Malaya, wherever they occur, would materially assist towards an improved quality copra.

The Bulletin contains five diagrams of types of Ceylon kilns, with notes on their advantages and disadvantages. The good quality of copra is achieved by careful preparation involving normally, one day's sundrying to prevent subsequent smoke adhesion; irregular nut arrangement on the kilns to a depth of not more than 18 inches: slow drying at the start, then two days hot drying, with finally one day's slow drying at the finish: the use of clean dry shells for firing and the practice of grading. Commercial Ceylon copra No. 1 shows a 2.5 per cent. greater oil content than Straits No. 1 copra.

A chapter is devoted to the financial, commercial and industrial aspects of the industry in Ceylon.

The introduction to the second part of the Bulletin concerned with "Coconuts and Coconut Products in Malaya", emphasises the need to establish a higher standard grade of the product exported from this country.

During 1931 copra exported from the Straits only realized an average price of £13.14.0 per ton in London as against £14.14.0 for that from Ceylon.

General investigations shew that the commercial growing of coconuts in Malaya is limited to "heavy" soils. A manurial scheme has been started whereby it is hoped to obtain evidence of the response to manuring of palms grown on different types of soil.

A chapter is devoted to the problem of copra deterioration, in which it is proved that careless methods of preparation, the inclusion of excessive water in the finished product and the use of badly designed kilns in which the material is exposed to cold draughts, are factors responsible for serious deterioration in quality and losses in quantity, during the period of local marketing and shipment. In a chapter on nut harvesting and storage, it is conclusively proved that the optimum yields of oil and copra are only obtained from wholly brown ripe nuts and that nut storage is only advisable for green nuts where a mixed crop is harvested. The results of experiments in copra drying on both a small and large scale are detailed, from which it is concluded that when careful and prolonged, continuous drying with moving, hot air is practised, a high percentage oil content, with reduced yields of dry grated copra, results. The explanation of this is its slow dehydration and perhaps also decomposition, without discolouration, of the "solids-not-fat". This accounts for the greater oil content of Ceylon copra, where four to five days drying is the custom, as against two to three days drying as generally practised in Malaya.

H. D. M.

MALAYAN COCONUT STATISTICS.

TABLE 1.
Area of Coconuts in Malaya 1930.

STATE OR TERRITORY.	TOTAL CULTURE			CULTURE		
	ON HOLDINGS OF			ON HOLDINGS OF		
	Over 100 acres each.	Under 100 acres each.	Total Immature area (Acres).	Over 100 acres each.	Under 100 acres each.	Total Mature area (Acres).
<i>Federated Malay States</i>						
Pelak	11,476	11,196	22,672	37,664	45,604	83,268
Selangor	5,398	35,519	40,917	32,429	36,948	69,377
Negeri Sembilan	155	1,121	1,276	914	3,776	4,690
Pahang	256	3,948	4,204	1,146	7,870	10,336
Total F.M.S.	17,285	54,784	72,069	73,463	94,198	167,661
<i>Straits Settlements</i>						
Singapore	...	...	...	...	...	...
Malacca	...	2,330	2,330	3,159	4,841	8,000
Dindings	...	1,696	2,589	...	10,255	12,585
Pe-Avnee Wellesley	893	1,438	3,621	1,763	2,177	4,530
Penang	2,183	359	667	15,415	17,785	33,200
Labuan	308	1,958	1,938	2,936	9,923	12,859
Brunei	...	681	681	...	1,238	1,238
Christmas Island	...	...	...	...	689	689
Total S.S.	3,384	8,462	11,846	23,274	46,927	70,201
<i>Unfederated Malay States</i>						
Labore	428	32,622	33,050	2,873	129,127	132,000
Kedah	361	8,453	8,814	492	17,382	17,874
Perlis	...	1,434	1,434	...	2,527	2,527
Kelantan	...	...	...	...	...	...
Trengganu	...	...	...	...	...	...
Total U.M.S.	...	...	...	...	...	...
Grand Total	...	...	...	...	...	...
Malaya	...	...	...	...	...	...
						599,747

TABLE 2.

Annual Exports of Copra from the Federated Malay States.

YEAR	PERAK	SELANGOR	NEGRI SEMBILAN	PAHANG	TOTAL F.M.S.
	Tons	Tons	Tons	Tons	Tons
1924	38,545	12,900	1,179	560	53,184
1925	40,007	15,426	2,236	315	57,984
1926	44,542	16,963	3,417	907	65,829
1927	39,499	14,121	3,302	615	57,536
1928	45,451	20,147	2,252	654	68,504
1929	45,897	20,937	1,493	700	69,027
1930	46,647	22,714	1,095	587	71,043
1931	41,259	23,683	202	439	65,583

TABLE 3.

Net Exports Coconuts Products from Malaya.

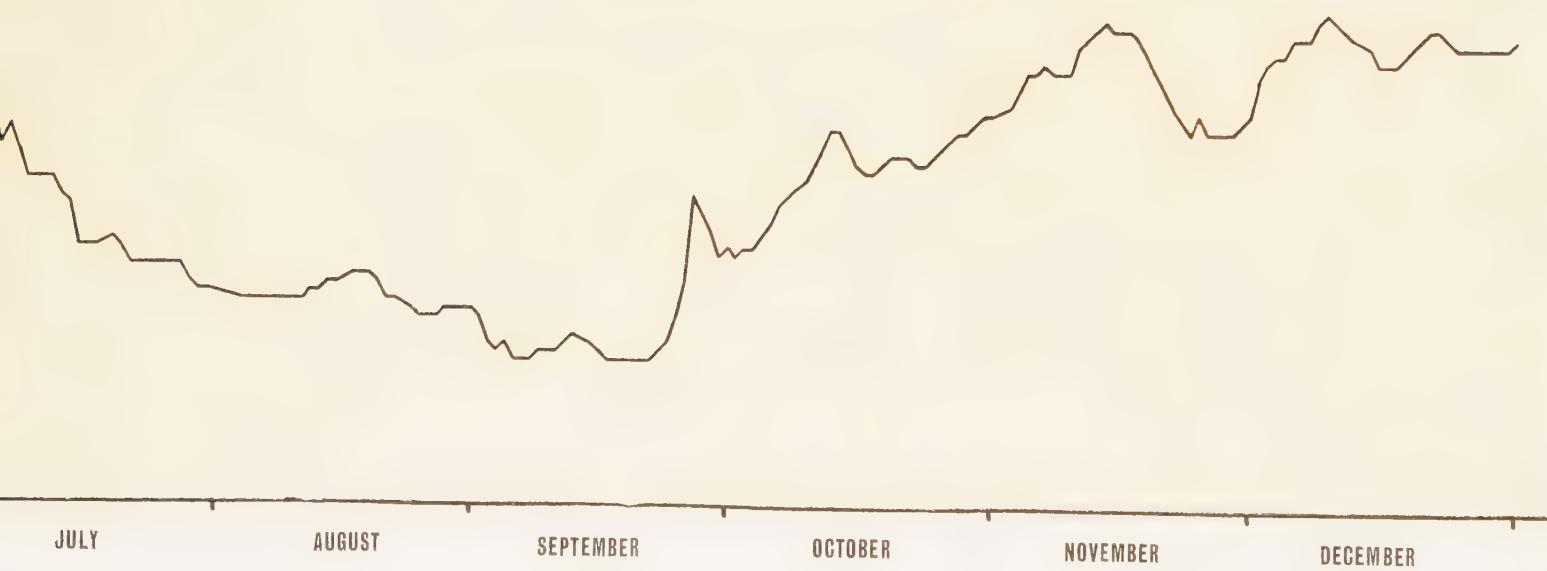
YEAR	FRESH COCONUTS		COPRA		COCONUT OIL		TOTAL COCONUT PRODUCTS	
	Tons	Value \$	Tons	Value \$	Tons	Value \$	Tons	Value \$
1923	—	374,215	90,606	18,084,568	6,378	2,062,721	—	20,521,504
1924	13,035	413,174	91,734	19,739,483	6,084	2,201,566	110,853	22,354,223
1925	13,202	463,666	86,420	19,074,387	7,673	2,830,943	107,295	22,368,996
1926	10,032	401,378	104,394	21,810,517	8,504	3,113,495	122,930	25,325,309
1927	15,988	655,796	86,504	16,538,385	10,275	3,470,281	112,767	20,664,462
1928	13,479	535,600	95,628	18,669,311	9,884	9,190,439	118,991	22,395,350
1929	10,239	479,345	112,429	19,662,622	8,725	2,507,279	131,393	22,649,246
1930	10,478	406,921	102,014	15,307,511	9,473	2,359,357	121,965	18,073,789
1931	10,468	243,058	100,809	9,677,676	9,909	1,637,591	121,186	11,558,325

COPRA "SUN" SINGAPORE DAILY MARKET



DRIED."

ET PRICES 1931.



K P CO LTD

Miscellaneous Article.

ENTOMOLOGICAL NOTES.

Second Quarter, 1932.

BY

G. H. CORBETT.

Considerable correspondence has been conducted relating to the control of insects and other pests during the past quarter. The principal enquiries were those relating to

(1). "Cutworms." (*Agrotis ypsilon* Rott.)

"Cutworms" are the caterpillars of moths and are so-called because of their habit of biting through the stems of young plants. The most important cutworm in Malaya is probably the caterpillar of *Agrotis ypsilon* Rott. This insect was reported from Fraser's Hill in March, 1925, damaging the grass of the golf course and from Cameron Highlands in October, 1927, injuring for the most part vegetable plants.

This insect is universally distributed and is an important pest in North America and Europe. "Cutworms" rest in the soil during the day and feed at night. The female moths lay their eggs generally where the ground is well covered with vegetation so that the young caterpillars can readily find food. The life-history has been worked out in the Lowlands; the egg hatches in about 3 days, the caterpillar is full-grown in about 25 days when it enters the ground for pupation and the pupal period lasts about 8 days—a total of about 36 days.

In addition to (1) keeping down weeds, especially sometime before planting takes place (2) hand collection of the caterpillars and (3) protecting plants by surrounding the stems with tins which have the bottoms knocked out, a poison bait has always proved successful in destroying large numbers of "cutworms". The bait, which should be distributed in the late afternoon, is either broadcasted at the rate of 10 lbs. dry weight to the acre about two days before the plants are to be planted out or a tablespoonful is placed near each plant or at every 2 or 3 feet in the row. The bait is composed of 1 lb. Paris Green to 50 lbs. bran with sufficient water to make moist but not sloppy. A cheap syrup which is considered to enhance the attractiveness of the bait is sometimes incorporated.

If available, frames with wire gauze covers will be found satisfactory in protecting such plants as lettuces but would probably be too expensive to be employed on a large scale.

(2). The Coconut Zygaenid (*Artona catoxantha* Hamp.)

The caterpillars of this moth which were received on April 6th. from the Banting area for identification and for advice concerning treatment were reported to extend over an area of some 60 acres of tall coconut palms. The full-grown

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caterpillar is about 10 mm. long with a purplish coloured dorsal stripe and with four longitudinal rows of fine hairs.

The occurrence of this pest at this time of the year is unusual and although it has numerous parasites, its disappearance has generally been considered to be due to high winds and heavy rains. Although these conditions have been prevalent, this moth has increased and the appearance of the attacked palms suggests that the leaves have been scorched by fire. Fortunately parasites are generally distributed and will probably prevent the moth becoming widespread.

The control of insects on 60-80 feet palms is rendered difficult since the machinery for spraying or dusting is not available and even if it could be supplied its transport would frequently be impossible owing to the nature of the land. Therefore alternative measures have to be suggested. In this case, grease banding the palms was recommended to prevent the caterpillars which had been blown by wind to the ground re-ascending the palms. This measure was eminently successful in so far that thousands of caterpillars were prevented from returning to the leaves.

The mixture which consisted of 16 lbs. of rosin dissolved in one gallon of castor oil was painted on the palms in rings about 2 inches wide.

The Manager has sent information that this treatment over the 60 acres of palms costs about 77 cents per acre and has supplied the following particulars :—

64 lbs. of Rosin	...	...	...	...	\$25.60
4 gallons Castor oil	...	...	...	...	10.00
Car hire	...	...	...	...	.60
Labour	...	...	...	...	10.05

					\$46.25

This mixture remains effective for at least two weeks and if rubbed with a coconut husk which has been steeped in castor oil will be revived.

(3). Coffee Berry Beetle Borer. (*Cryphalus hampel* Ferr.)

The attention of the planting community has on previous occasions been drawn to the danger of this beetle gaining entrance into non-infested areas by the introduction of seeds for planting purposes or beans for consumption from infested areas and an enquiry was received asking for information on this matter.

There is a real danger of introducing this beetle unless the seeds and beans are treated, so rendering them free from this insect.

The market price at present for non-infested good quality beans is \$25 per pikul, but for infested beans \$16 per pikul. It will be seen therefore that a loss of about \$9 per pikul may be attributed to this beetle. It should be emphasised that this loss is continuous and although regular weekly collection of bored green and ripe berries will increase the percentage of unbored ripe berries,



COCONUT PALMS DAMAGED BY THE CATERPILLARS
OF *Artona*.

consideration should undoubtedly be given to prevent the formation of berries over a period of some four months. Mr. W. H. Barnes, Agricultural Field Officer, Negri Sembilan, has informed me that an area of coffee which was badly infested with this insect was stripped of all fruits and kept free of berries for a period of six months and all fallen berries collected. About 18 months after stripping he reported that he had examined this area and was unable to find a single case of coffee berry borer attack though the trees were fruiting heavily and ripe coffee was plentiful. This area was not adjacent to other coffee areas.

(4). Mailing Insects.

Enquiries are received concerning insects which on arrival are frequently unrecognizable and the description of the injury or supposed damage to plants so doubtful that in many cases control measures cannot be advanced. To facilitate the work in connection with an enquiry, the following directions should be observed :—

1. Match or cardboard boxes, since they are often broken in transit, should not be used for sending insects. Wooden boxes, especially for long distances, are better than cigarette or biscuit tins. All containers should be ventilated. Glass tubes should not be corked but plugged with cotton wool. A wood borer should be despatched in a ventilated tin box.

2. As many specimens of the insect as possible should be forwarded, though overcrowding should be avoided by employing more packages.

3. Two species of insects should not be placed in the same box since one may live at the expense of the other.

4. All insects and larvae (grubs, maggots, caterpillars etc.) should be sent alive with a supply of food, and after collecting despatched as soon as possible.

5. All packages should be distinctly marked Live Insects and should bear the name and address of the sender.

6. A letter should always accompany the package giving a full account of the nature and extent of the damage, the part or parts, and the name or names of the plants attacked, and the date when first noticed.

Departmental.

FROM THE DISTRICTS.

The Weather.

Rainfall in the central portions of the Peninsula was below the normal for the month, with the exception of Pahang where the fall was average, with heavy precipitation in Bentong District. In Kedah the weather was variable in different districts, being wet in the North during the first week of the month. In Penang and Province Wellesley it was showery with frequent strong winds.

Johore experienced only occasional showers which became more frequent towards the end of the month, while in Singapore the weather was wet.

Remarks on Crops.

Rubber.—Prices for small-holder's rubber showed a decrease on those of the previous month, and ranged in dollars per pikul from \$3 to \$7 for smoked sheet and from \$2.75 to \$5.50 for unsmoked sheet. The areas out of tapping among small-holdings had further increased. It is probable that in many districts this increase was only due to the absorption of all available labour in work in the padi fields. The Agricultural Field Officer, Penang and Province Wellesley, alone reports that no new untapped areas have been observed in his district during the month. The occasional cutting out of small areas of rubber with the object of planting food crops was reported as continuing in almost all districts.

The position with regard to mouldy rot remains unchanged: sporadic outbreaks have occurred in Province Wellesley and Johore with the advent of damp weather.

Padi.—Throughout the Peninsula, many new padi areas are reported to be in preparation this season. Work in the fields was in various stages of progress and was being carried out with unusual thoroughness.

Planting was in progress or completed in Selangor, Negri Sembilan, with the exception of Kuala Pilah District and Pahang.

Preliminary clearing was carried out in North Kedah, Province Wellesley and Perak; the work was somewhat more advanced in Johore, where in some areas transplanting had begun. In most parts of Malacca and in Kedah South, the work was delayed by draught.

The area under wet padi in Johore has increased by 3,592 acres since 1931 and that under dry padi by 1,036 acres.

The work of rat destruction is reported throughout to be progressing satisfactorily. The few outbreaks of insect pests observed have been of minor importance.

There has been a moderate distribution of pedigree strain seed in all States during the month; in Malacca the total amount distributed to the end of June was 2,610 gantangs. In part of Kuala Pilah District of Negri Sembilan the

long-season padi Seraup Kechil No. 36 has been in demand, while in Perak South preference has been shown for short-season strains with the object of obtaining two crops per year.

In the Dindings padi planters in two localities are co-operating under the guidance and advice of the Penghulu and the Malay Agricultural Assistant in the construction of bunds to keep out sea water which severely damaged their padi in the past season. They assemble about once a week for this work and have made satisfactory progress. The provision of the necessary water-gates was considered at meetings organised by the Malay Agricultural Assistant.

Coconuts.—An increasing interest in the cultivation of this crop and in the improvement of manufacture of copra has been evinced in most districts. This was particularly noticeable in Selangor and Lower Perak where several new and improved types of kiln have been erected in accordance with departmental instructions.

In Kuala Selangor the manuring of palms by native cultivators has been observed. New plantings of this crop have been reported to replace felled rubber trees. Crops generally have been good during the month. The report from Malacca states that the local market for nuts is poor. As many Chinese kilns have stopped the preparation of copra, there has been a small export of nuts from the Settlement.

Prices for copra have ranged between \$3 and \$5 per pikul.

Tobacco.—Kedah and Johore are the only States which report a slight increase in areas under tobacco.

A decline in its cultivation owing to the fall in price, is reported in Perak, Selangor and Province Wellesley.

A good crop was grown and cured at the Alor Star Vagrants' Camp in Kedah and was supplied to the inmates.

Prices for cured leaf have ranged between \$10 and \$30 per pikul in the above-mentioned States. In Pahang, however, the price range for locally prepared tobacco has been from \$48 to \$144, in Negri Sembilan \$40 to \$90 and in Johore \$35 to \$80.

Tea.—The gardens at Sungei Balak in Selangor have made considerable headway, combined with improvement in pruning and cultivation methods. On Cameron Highlands Experimental Plantation there are now 44½ acres under this crop. The tea "flushed" well during the latter part of the month. It was found that by plucking leaf at intervals of eight days the made tea had a better appearance. The crop harvested during the month was 1,959 lbs. of green leaf, approximating to 245 lbs. of made tea per acre per annum.

Pineapples.—In Johore and in Selangor, the area under this crop has been extended. A Chinese pineapple grower in Kuala Langat has planted up a further area of 250 acres. Good crops have been harvested during the month.

In Singapore the fruit packers complained that fruit supplied recently has been small and unsuitable. They stated that fruit from plants over five years old is useless for canning. In this connection it should be remembered that it

is not at present the usual practice to manure this crop.

Fruit.—In most parts of the Peninsula heavy crops of durian and mangosteen were harvested and rambutan had commenced to ripen.

In Province Wellesley there was a glut of the two former fruits which were selling at 3 to 4 cents each and 8 cents per 100 respectively: some of the surplus was exported to other States and to neighbouring countries. In Kedah these fruits were only beginning to appear on the markets, while in Negri Sembilan the durian crop was disappointing, except in Rembau district, and mangosteens and rambutans were only beginning to ripen.

In Johore durians were selling for 3 to 4 cents each and mangosteens for 30 cents per 500 in the villages, although the retail prices in the markets of Singapore and Johore Bahru are reported to have been 7 to 10 cents per kati for durians and 6 to 8 cents for 10 mangosteens.

Maize.—In Kedah the harvesting of maize was in progress and a large quantity of ears exposed for sale in the local markets and weekly fairs indicated unusual attention to this useful crop.

Weekly Fairs.

Village fairs are reported generally to have continued to serve a useful purpose. In Selangor alone fairs have been started in eight new centres, all of which have been well patronized. In places the prices obtained for produce have been higher than those of the local shops. A point of interest at the fairs in Kedah was the active business done in the sale of ploughs and other implements for padi cultivation. This is not only a novel feature in itself but an indication of a further gratifying extension in the area that will be planted with wet padi in the State this season.

Agricultural Stations and Padi Test Plots.

NEGRI SEMBILAN.—The work of jungle felling has been completed at the new Kuala Pilah Agricultural Station and root extraction was begun. Each area was banded and planted with leguminous cover crops as soon as it was cleared.

MALACCA.—A solar propagator for the rooting of cuttings was erected at the Sungei Udang Station.

The water-pumping plant at Pulau Gadong Padi Test Plot proved itself invaluable during the month, as without it the deficiency of rain would have prevented the preparation of the land and the sowing of the nurseries. It ran for a total of 15 hours.

Crops of ground nuts have been harvested on the Kuala Kangsar and Kuala Lipis Agricultural Stations, where the yield at the former was 1,100 lbs. per acre.

General routine work has progressed very satisfactorily at all the other Stations.

DEPARTMENTAL NOTES.

Tour of Director of Agriculture.

The Director of Agriculture made a visit of inspection of the Dairy Farm, Fraser's Hill on 2nd. and 3rd. June, 1932.

Inter-Departmental Agricultural Conference, 1932.

It is proposed to hold an Inter-Departmental Agricultural Conference at Kuala Lumpur from 2nd to 6th August, 1932. The Conference will thus directly follow the Malayan Exhibition to be held at Kuala Lumpur on July 30th and 31st and August 1st.

Two successful agricultural conferences have been held in Kuala Lumpur in 1929 and 1930. The coming Conference, however, is conceived on rather different lines from its forerunners and is intended to deal with the agricultural proprietary owners and occupiers.

The object is to examine existing agricultural industries, other than rubber, with a view to ascertaining the present position, the immediate outlook and possible improvements and the means of introducing such improvements, using as far as possible existing machinery and resources. It is also intended to endeavour to ascertain what, if any, new industries can be introduced and what industries at present existing on a restricted scale can be extended with the idea of lessening the dependence of this country on imported staples.

Memoranda are being drawn up containing, in a concise form, information of the present statistical position, condition of cultivation and the chief directions in which improvements are possible of crops grown in Malaya.

At the Conference the memoranda will be discussed and resolutions framed summarising the main conclusions arrived at.

The Conference will also discuss the general economics of peasant agriculture with special reference to grading and marketing peasant produce and the finance of peasant agriculture. Chinese agriculture may also find a place in the discussion.

Other questions to be treated, if time permits, are livestock policy, particularly in relation to the supply of poultry, eggs and meat; agricultural work in the schools, prize-holding schemes, shows and the like.

The desirability of devoting one session of the Conference to land questions in relation to the various crops considered will also be kept in view.

The Conference is to be regarded not merely as an agricultural officers' conference, but as an inter-departmental gathering, the field of which covers the whole field of Malayan agriculture in relation to smaller proprietary holdings, excluding rubber.

Coconuts in Lower Perak.

As reported in these notes last month, the Assistant Chemist for Copra Investigations made a tour through the coconut plantations—large and small—in the Lower Perak District between May 22nd. and 28th.

His report on this visit is now to hand and contains remarks and criticisms

which should be of considerable value to copra producers in general, and to those of Lower Perak in particular.

The report states that although the grade and moisture content of copra exports from the district are normal, and insects and moulds practically absent, the worst features are smoke and red colouration of the product.

Careful harvesting is now being practised in nearly all the estates. Fewer estates are using water transport of nuts to factory, while a great number are splitting the nuts in the field. When delay occurs, this change has resulted in deterioration of quality.

With few exceptions, kilns are seriously overloaded and a half nut arrangement face downwards is causing serious deterioration.

In certain instances, extremely muddy conditions were found in the splitting yards.

Kiln Design. Every kiln had its own characteristics and with two exceptions only, they all required minor or major alteration to ensure uniform conditions of drying.

Generally, an excessive number of ventilation holes was provided, smoke escape was too liberal and cold draughts were allowed to play on the copra.

If better draught protection is provided, it will be necessary to have a jack roof fitted or to open up the roof near the ridge to provide top ventilation so as to avoid stagnation. Partition walls in the fire pit were absent in all cases.

In certain instances, kilns were not erected against the prevailing wind and on the sea front this is a very serious fault.

In a few cases, a shell fuel store was provided in the kiln verendah, in all other cases no special care was taken to keep the fuel dry and in one instance the fuel was actually stored in the path of roof water.

Number of Kilns. Yields have in most cases increased without corresponding increase in kiln accommodation with the result that in many cases the kilns are permanently overloaded, while in practically all cases, there is no provision for bumper harvests.

The correct normal load per square foot is $\frac{N}{10}$ where N = number of nuts per picul. Normal loads recorded were 39, 25, 42, 33, 20, 41, 30, 25, 29, 33, 25, 33, 33. The correct load for this district is 25 nuts per square foot or less.

Leave.

Mr. B. Bunting, Agriculturist, has been granted 7 months and 12 days leave on full pay with effect from 11th June, 1932.

Mr. J. N. Milsum, Assistant Agriculturist, returned from leave of absence on 9th June, 1932.

Retirement.

Mr. C. M. Maggs, Horticultural Assistant, has been granted 2 months and 2 days leave on full pay from 11th June, 1932.

Owing to ill-health, Mr. Maggs has been medically boarded out of the service.

MEETING OF THE AGRICULTURAL ADVISORY COMMITTEE HELD ON MAY 26th 1932.

A meeting of the Agricultural Advisory Committee was held on May 26th, 1932, at which the following members were present :—

Director of Agriculture	-	-	Dr. H. A. Tempany (<i>Chairman</i>).
Director of Co-operation	-	-	Mr. A. Cavendish.
Ag. Director, R.R.I.	-	-	Mr. A. Sharples.

Messrs G. S. Reis, W. A. Stanton, C. B. Towill and the Chief Research Officer (Secretary).

The Chairman welcomed Mr. Towill to the Committee and announced with regret the resignations of Messrs. Egmont-Hake and Kennaway. He explained that he had not called a meeting of the Committee in the first quarter of the year as he desired on his return from leave fully to acquaint himself with the progress of work in the Department before doing so.

At the meeting various subjects were discussed, these included.—

Padi. The Committee was informed that tests on the culinary qualities of 12 different selected varieties of strains of padi had been carried out in 9 places. The tests were based on opinions recorded on cooked samples of each by a number of Malays and other habitual rice eaters. The tests showed that a few of the varieties were popular in every centre and that a few were equally unpopular. Further tests with a smaller number of varieties which are known to be heavy yielders are being arranged.

The question was discussed of the possibility of using the 'floating padis' of Indo-China for cultivation in Malaya in districts liable to flooding; it was pointed out that floods in Malaya are usually of short duration and that when they occur the water usually runs very rapidly; in such circumstances it seemed unlikely that floating padis will be useful.

The meeting was informed that specimens of high yielding Italian padi collected by the Chairman while on a visit to the Italian rice fields had been tried out and had not so far proved successful. A small quantity of seed from the plants sown at Malacca had been collected and would be planted in the coming season in the endeavour to acclimatise these varieties.

Coconuts. The Committee was informed that up to the present it had not been possible to inaugurate the projected series of manurial experiments on young coconut palms owing to shortage of funds consequent on the financial stringency. It was, however, hoped that it might be possible to start an experiment in the near future.

The Committee was informed that Messrs Cooke, Assistant Chemist, Copra Research and Simpson, Agricultural Field Officer, Selangor, had written an interesting report on attempts made by them to improve the quality of copra produced by small-holders in the District of Kuala Selangor. Their work had shown that it was easily possible for small-holders to construct satisfactory

small kilns for a very low cost in which with care copra of good quality could be produced. The copra capable of being produced in such kilns, although below Ceylon No. 1 quality, is definitely much above the present average of Malayan small-holder's copra, whether prepared by the Chinese middleman or by the small grower himself.

The meeting was informed that experiments on the control of epiphytic growths on oil palms and coconuts by spraying with common salt or with sodium chlorate had been in progress in Kuala Lumpur for some time past. The results had not been encouraging so far. Further experiments were in contemplation with a view to ascertaining whether epiphytics were in any degree harmful to trees. A member pointed out that he believed that some years ago some experiments on the latter point had been conducted on a coconut estate and that so far as his recollection went, it was found that epiphytes did not harm coconut palms.

Oil Palms. In continuation of discussions at previous meetings, the Committee further considered the question of the control of rats by means of virus. It was pointed out that the Director, Institute for Medical Research, estimated that a sum of \$10,000 would be required to carry out an investigation extending over two years into the possibility of obtaining an efficient local virus. The Committee was informed that in the opinion of the Chairman and his technical officers, the expenditure of this sum would be of doubtful utility as it seemed improbable that the work would lead to results of lasting value. It appeared that even if a virulent virus was isolated it was probable that immunity would be acquired by rats in due course and this would rapidly render the work ineffective. It was agreed that while it was obviously desirable to explore every avenue which might assist in securing rat control, the present financial stringency, combined with uncertainty whether lasting and effective results could possibly follow work along these lines, did not permit a recommendation to be made to Government that it was available to incur the suggested expenditure.

In connection with rat control the question of the action of Government in discontinuing the grant of pack licences for estate dogs was raised. In the opinion of the Committee organised rat hunts with packs of dogs are an exceedingly valuable method of rat control on oil palm estates.

Dairy Farm at Fraser's Hill. In connection with certain queries as to the Dairy Farm at Fraser's Hill deferred from the preceding meeting, the Committee was informed that the milk of the Freisian herd at Fraser's Hill was thoroughly satisfactory in quality. The average fat content was well over 4 per cent. as compared with the English legal requirements of 3 per cent. The principal reason why the importation of Freisian cattle had been decided upon was that experience in various parts of the tropics had shown that this breed could be acclimatised with greater ease than any other and gave higher yields. The results at Fraser's Hill so far had been excellent both as regards yield of milk and health of animals. Surplus young stock from the herd was sold off as available.

Fertilisers Enactment. The Committee was informed that after extensive consideration of the projected Fertilisers Enactment by the Governments and by commercial and planting interests, it had been decided, in view of the present financial situation, that it was inadvisable to proceed with the legislation for the present.

Soil Erosion. The Committee considered further the question of measures to prevent soil loss when opening up areas in the central highlands. The question had been dealt with on previous occasions, while the report of the Ceylon Committee on the prevention of erosion had been circulated among members.

The question as to the maximum slope which it was desirable to allow to be deforested in the interests of the prevention of erosion was discussed. In Ceylon the limit had been fixed at 45°.

The Chairman read to the meeting a summary prepared by the Chief Field Officer in which were described certain recent investigations on the subject which had been undertaken by the Field Branch of the Department of Agriculture in collaboration with the Forest Department. As the result of the investigation it had been possible to make certain recommendations to Government. The main feature of these recommendations was that 40° should be regarded as the extreme limit of steepness of slopes which could be deforested without risk of serious loss and damage and that large areas on which the slope exceeded 40° should not be cleared. Small areas having a slope in excess of 40° and which being contained in a larger area of lesser slope did not reveal themselves before clearing should immediately be allowed to grow up again in blukar and should not be planted with tea or other commercial crops. From the reports of inspecting officers it did not appear that this limitation would exclude from cultivation any great areas of land which would otherwise be cultivated at Cameron Highlands or its environs.

Giant Snails. In reply to an enquiry the Chairman stated the giant snail could undoubtedly cause considerable damage in gardens and some forms of cultivation, but that in the opinion of the Department it should be controlled by keeping down long grass, avoiding rubbish heaps etc. which served as breeding places for the snail; an attempt had been made recently with the co-operation of the Selangor Gardening Society to stimulate interest in the systematic destruction of the snail. It is considered that provided proper vigilance is exercised, the snails should not be a greater menace to vegetable gardeners than they are to flower gardeners; the large size of the pest renders it comparatively easy to control. A promise was given to the Committee that propaganda would be undertaken with a view to stimulating efforts for the destruction of the pest.

Subjects discussed additional to the above comprised the Chairman's memorandum to the Retrenchment Commission on reduction in expenditure in the Department, potato cultivation at Cameron Highlands, the effect of cover crops and grasses on crops, the position of tobacco cultivation, the import of fodders in Malaya and Departmental officers' reports.

Statistical. MARKET PRICES.

June, 1932.

Rubber.—The average June spot price of rubber smoked sheet equal to London Standard was 4.95 cents per lb. in Singapore, 2.64 cents (Gold) New York and 1.72d. London, as compared with 5.39 cents Singapore, 3.04 cents (Gold) New York and 1.81d. London in May. The Singapore price during June varied from 4 13/16 to 5 1/16 per lb.

Palm Oil.—The following are the quotations received in Kuala Lumpur weekly in June for palm oil c.i.f. Liverpool on a basis of 18 per cent. f.f.a.—1st. £15, 8th. £14.10s., 15th. £14, 22nd. £15, 29th. £14.10s. The market closes easy.

Palm kernels were quoted at £9.10s. on June 2nd.

Copra.—Market improved slightly during the month, though the average price is less than that of May. The Straits Homeward Conference has reduced the rate of freight to 30s. per 12 cwt., following this with an announcement that a contract had been entered into with Unilevers Ltd. whereby all their copra for Europe is taken at the nett basis rate of 27s. per 12 cwt.

The Singapore average price of Sundried in June was \$5.17 per picul as compared with \$5.48 in May, while the average June quotation for Mixed was \$4.72 as compared with \$4.92 in the pervious month.

Copra cake average \$1.78 per picul in June.

Coffee.—June prices shew some decline over those ruling in May. Palambang coffee averaged \$16.87 per picul as compared with \$18.54 in May. Sourabaya coffee averaged from \$20.94 to \$22.87, the price within this range depending upon quality.

Aracanuts.—Palambang averaged \$2.77 per picul and Bila Whole \$2.90 per picul in June as compared with \$2.75 and \$2.87 respectively in May. Average prices per picul in June for other grades were :—Split \$3.56 to \$5.19, Red Whole \$6.50 to \$7.50, Sliced \$9.62 to \$12.81, Kelantan Split \$5.01 to \$5.41, the price within each range depending upon quality.

Rice.—The following are the average wholesale prices per picul of rice in Singapore during May 1932 :—Siam No. 2 Ordinary \$3.77, Rangoon No. 1 \$3.86, Saigon No. 1 \$3.92 as compared with \$3.82, \$3.89 and \$4.01 respectively in April.

The average retail market prices in cents per gantang of No. 2 Siam rice in May were :—Singapore 29, Penang 37, Malacca 29, corresponding prices in April being 31, 38 and 30.

Gambier.—Cube No. 1 dropped from \$16 to \$13 per picul, the average for June being \$14.70 as compared with \$16.62 in May. Block gambier has varied from \$7.50 to \$8 per picul, the average for June being \$7.70 as compared with \$7.69 in the previous month.

Pineapples.—Canners' schedule of prices has been discarded and prices have

slumped badly. Unseasonable weather in England, with virtual closing of the Canadian market and a large "pack", combined with the reduced buying power of the world, are stated to be the causes of the break. Average prices per case in Singapore during June were:—1½ lb. cubes \$3.27, 1½ lb. sliced flat \$3.15, 1½ lb. sliced tall \$3.32 as compared with \$3.50, \$3.30 and \$3.50 respectively in May.

Tapioca.—Prices remained steady until the end of the month when both flake and pearl medium sagged. Average prices per picul in Singapore during June were:—Flake fair \$3.37, Pearl, seed \$3.80 and Pearl, medium \$4.20. Corresponding prices in May were \$3.00, \$3.80 and \$4.25.

Sago.—Prices fairly steady. Pearl, small fair averaged \$4.30 per picul in June, as compared with \$4.25 in May; Flour, Sarawak fair averaged \$1.93 per picul as compared with \$2.04 in May.

Mace and Nutmegs.—Siouw mace has appreciated in value, while Amboina shewed a decline at the end of the month. Average Singapore June prices per picul were; Siouw \$52.60 as compared with an average of \$61 per picul in May, Amboina \$37.40 per picul in June as compared with \$44 in May.

The better quality nutmegs improved in value during the month, while the cheaper grade shewed some decline. 80's averaged \$27.90 per picul in Singapore as compared with \$27.25 in May; 100's averaged \$23.50 in June as compared with \$24 per picul in the previous month.

Pepper.—The demand has been easily satisfied by the new crop coming forward. Prices have shewn some improvement during the month. Singapore average prices per picul in June were:—Singapore black \$18.30, Singapore white \$22.70, Muntok white \$23.50 as compared with \$18.56, \$22.25 and \$22.75 in May.

Cloves.—Prices have been generally nominal, but during the latter part of June shewed a downward tendency. Average quotations per picul in June were:—Zanzibar \$44 per picul as compared with \$47 in May; Amboina \$47.80 per picul as compared with \$50 in May.

The above prices are based on London and Singapore quotations for rubber and on the Singapore Chamber of Commerce Weekly Reports published in June. Palm oil reports are kindly supplied by Messrs. Cumberbatch and Co., Ltd., Kuala Lumpur, and reports on the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore.

1 picul = 133½ lbs. The dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural products. Similar assistance is also offered by the Malayan Information Agency, 57 Charing Cross, London, S.W.1.

GENERAL RICE SUMMARY.*

May, 1932.

Malaya.—Gross foreign imports of rice (including stocks available for re-export) during May, 1932, amounted to 38,225 tons as compared with 58,849 tons in May, 1931, of which 48.2 per cent. were consigned to Singapore, 17.8 per cent. to Penang, 8.0 per cent. to Malacca, 22.9 per cent. to the Federated Malay States, and 3.1 per cent. to the Unfederated Malay States.

Of these imports 60.3 per cent. were from Siam, 38.2 per cent. from Burma, 0.5 per cent. from French Indo-China and 1 per cent. from other countries.

Total foreign exports of rice in May, 1932, were 12,557 tons (including 105 tons domestic production, exported from Penang) as compared with 13,285 tons in May, 1931. Of these exports 88 per cent. went to Netherlands India and 12 per cent. to other countries.

Net Imports for the period January to May, 1932, were 165,207 tons as compared with 221,436 tons for the same period of 1931, a fall of 25.4 per cent.

Malayan padi reports indicate that work for the season 1931—32 is in hand in all areas. Harvesting has been completed in Perak, Pahang, Malacca, Province Wellesley, Penang and Kedah. It is in progress in the Dindings, where prospects are reported to be poor.

India.—Total foreign exports of Rice (*Indian Trade Journal* 26.5.32) during March, 1932, were 357,000 tons as compared with 241,000 in February, 1932 and 264,000 tons in March, 1931, increases of 48.2 per cent. in respect of the previous month and 35.2 per cent. in respect of the same period of the previous year.

Total exports of rice and bran from Burma for the period January 1 to April 30, 1932, amounted to 1,374,727 tons as compared with 1,405,078 tons for the corresponding period of 1931, or a decrease of 2.2 per cent.

Of these exports 336,030 tons went to India in 1932 as compared with 599,343 tons in 1931, a decrease of 43.9 per cent.

Siam.—The *Bangkok Times* of May 25, 1932, states that by the report on the padi crop for the year 1931—32, in the seven main exporting circles, the area under padi was 4,487,524 acres, a drop of 136,212 acres or 2.94 per cent. as compared with 1930—31. It was even 27,800 acres less than in 1929—30, but more than in any year before that. The damaged area was 906,604 acres as compared with 542,240 acres a year ago, being 20.2 per cent. and 11.7 per cent., respectively, of the planted area. The area harvested was 3,580,920 acres, which is 500,500 acres less than the previous year and the yield was 2,276,520 tons, being 313,500 tons less than in 1930—31.

Exports of rice from Bangkok during April 1932 amounted to 113,555 tons as compared with 116,281 tons in April 1931 or a decrease of 2.3 per cent.

*Abridged from the Rice Summary for May 1932, compiled by the Department of Statistics, S.S. and F.M.S.

Exports of rice from Bangkok during the period December 1931 to April 1932 amounted to 611,984 tons an increase of 88,490 tons or 16.9 per cent. as compared with the same period of 1930—31.

Japan: Formosa.—*The International Crop Report*, Rome, for April, 1932, states that cold weather late in February slightly checked the growth of rice of the first crop in seedling beds, but no great damage was noticeable. Growth in March was normal. Transplanting was started in the North, while it was almost finished in the Central and Southern parts of the island.

Netherlands India: Java and Madura.—*The Korte Berichten* states that at the end of April, 1932, the area harvested amounted to 2,640,750 acres, an increase of 40,250 acres or 1.5 per cent. as compared with the same period of 1931, the area damaged to 77,789 acres a decrease of 16,805 acres or 17.8 per cent. as compared with 1931, and additional plantings awaiting harvest to 5,587,750 acres an increase of 87,500 acres as compared with 1931, a total of 8,306,289 acres as compared with 8,195,344 acres for the same period of 1931, an increase of 1.4 per cent.

French Indo-China.—Entries of padi at the port of Cholon from 1.1.23 to 31.5.32 amounted to 550,092 (metric) tons, an increase of 65,955 tons or 13.6 per cent.

Exports of rice from Saigon for the period 1.1.32 to 31.5.23 amounted to 533,172 (metric) tons an increase of 106,103 tons or 24.8 per cent. as compared with the same period of 1931.

The International Institute of Agriculture, April, 1932, states that in Indo-China the latest estimate places the total production at a possible maximum of 5,625,000 tons of padi.

Europe and America.—Quantities of rice shipped from the East were:—

- (a) To Europe, period January 1 to May 12, 1932, 402,912 tons as compared with 352,067 tons for the same period of 1931, an increase of 14.4 per cent.

Of the 1932 shipments 62.9 per cent. was from Burma, Nil from Japan, 29.5 per cent. from Saigon, 2.3 per cent. from Siam and 5.3 per cent. from Bengal, as compared with 67.7 per cent. from Burma, 3.8 per cent. from Japan, 16.9 per cent. from Saigon, 6.4 per cent. from Siam and 5.2 per cent. from Bengal in 1931.

- (b) To the Levant, period January 1 to April 7, 1932, 31,261 tons, an increase of 16,921 tons or 118.0 per cent. as compared with the same period of 1931.
- (c) To the West Indies and America, period January 1 to April 2, 1932, 53,009 tons, an increase of 4,922 tons or 10.2 per cent. as compared with the same period of 1931.

Erratum.

Malayan Agricultural Journal for June 1932, page 323, line 2, for "46.6 per cent." read "64.6 per cent."

ACREAGE OF TAPPABLE RUBBER OUT OF TAPPING ON ESTATES OF 100 ACRES AND OVER, MALAYA, AT END OF APRIL, 1932.

STATE OR TERRITORY	Acres of Tappable Rubber end 1931	ESTATES WHICH HAVE ENTIRELY CEASED TAPPING			ESTATES WHICH HAVE EARLY CEASED TAPPING		
		Acreage	Percentage of		Acreage	Percentage of	
			(3) to (2)	(4)		(5) to (2)	(6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Perak	238,420	10,857	4.6	28,887	12.1	39,744	16.7
Selangor	294,030	13,618	4.6	36,261	12.3	49,879	16.9
Negri Sembilan	217,002	14,815	6.8	24,190	11.1	39,005	17.9
Pahang	35,122	3,438	9.8	4,461	12.7	7,899	22.5
Total F.M.S.	784,574	42,728	5.4	93,799	12.0	136,527	17.4
Malacca	110,288	4,405	4.0	20,261	18.4	24,666	22.4
Province Wellesley	44,055	4,940	11.2	7,681	17.4	12,621	28.6
Dindings	6,700	194	2.9	1,251	18.7	1,445	21.6
Penang Island	1,585	1,058	66.8	84	5.3	1,142	72.1
Singapore Island	28,033	10,016	35.7	5,897	21.0	15,913	56.7
Total S.S.	190,661	20,613	10.8	35,174	18.4	55,787	29.2
Johore	313,385	27,676	8.8	41,126	13.1	68,802	21.9
Kedah (a)	102,220	5,209	5.1	9,161	9.0	14,370	14.1
Kelantan	16,785	6,742	40.2	1,590	9.5	8,332	49.7
Trengganu (b)	4,300	Nil	Nil	Nil	Nil	Nil	Nil
Perlis	624	308	49.4	156	25.0	464	74.4
Total U.M.S.	437,314	39,935	9.1	52,033	11.9	91,968	21.0
TOTAL MALAYA	1,412,549	103,276	7.3	181,006	12.8	284,282	20.1

Notes:—1. (a) Registered companies only and are rendered quarterly, commencing with June 1931.
(b) Registered companies only.

2. Areas rested due to rotational tapping system end April (not included above): Acres F.M.S. 44,255, S.S. 15,848, U.M.S. 48,309, or 7.7 per cent. of tappable area (col. 2).
Compiled from Statistics prepared by the Statistics Department, S.S. & F.M.S.

ACREAGE OF TAPPABLE RUBBER OUT OF TAPPING ON ESTATES OF 100 ACRES AND OVER, MALAYA, AT END OF MAY, 1932.

STATE OR TERRITORY	Acreage of Tappable Rubber end 1931	ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		ESTATES WHICH HAVE PARTLY CEASED TAPPING		Total (3) + (5)	Percentage of (7) to (2)
		Acreage (3)	Percentage of (3) to (2) (4)	Acreage (5)	Percentage of (5) to (2) (6)		
(1)	(2)					(7)	(8)
FEDERATED MALAY STATES :—							
Perak	238,420	13,104	5.5	31,065	13.0	44,169	18.5
Selangor	294,030	23,594	8.0	33,277	11.3	56,871	19.3
Negri Sembilan	217,002	19,096	8.8	23,861	11.0	42,957	19.8
Pahang	35,122	4,288	12.2	4,913	14.0	9,201	26.2
Total F.M.S. ...	784,574	60,082	7.7	93,116	11.9	153,198	19.5
STRAITS SETTLEMENTS :—							
Province Wellesley	44,055	4,419	10.0	8,099	18.4	12,518	28.4
Dindings	6,700	389	5.8	1,126	16.8	1,515	22.6
Malacca	110,288	5,672	5.1	20,912	19.0	26,584	24.1
Penang Island	1,585	1,058	66.8	104	6.6	1,162	73.3
Singapore Island	28,033	12,992	46.4	4,506	16.1	17,498	62.4
Total S.S. ...	190,661	24,530	12.9	34,747	18.2	59,277	31.9
UNFEDERATED MALAY STATES :—							
Johore	313,385	38,125	12.2	41,686	13.3	79,811	25.5
Kedah (a)	102,220	5,209	5.1	9,161	9.0	14,370	14.1
Kelantan	16,785	7,726	46.0	1,590	9.5	9,316	55.5
Trengganu (b)	4,300	nil	nil	nil	nil	nil	nil
Perlis	624	308	49.4	156	25.0	464	74.4
Total U.M.S. ...	437,314	51,368	11.7	52,593	12.0	103,961	23.8
TOTAL MALAYA ...	1,412,549	135,980	9.6	180,456	12.8	316,436	22.4

Notes :—1. (a) Registered companies only and are rendered quarterly, commencing with June 1931.
(b) Registered Companies only.

2. Areas rested due to rotational tapping system end May (not included in above table) : Acres F.M.S. 44,862, S.S. 15,707, U.M.S. 50,536 : Total 111,107 Acres, or 7.9 per cent. of tappable area (Col. 2).
Compiled from Statistics prepared by the Statistics Department, S.S. & F.M.S.

MALAYA RUBBER STATISTICS **TABLE I**
STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX,
FOR THE MONTH OF MAY, 1932 IN DRY TONS.

Territory	Stocks at beginning of month 1			Production by Estates of less than 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports			Exports including re-exports				Stocks at end of month				
	Ports	Dealers	Estates of 100 acres and over	during the month	during the year 1932	during the month	during the year 1932	during the month		during the year 1932		during the month		during the year 1932		Ports	Dealers	Estates of 100 acres and over	
								Foreign	From Malay States	Foreign	Local	Foreign	Local	Foreign	Local				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
MALAY STATES:—																			
Federated Malay States	...	18,695	12,812	11,809	58,932	8,111	38,188	Nil	Nil	Nil	Nil	16,142	4,761	67,297	29,443	...	17,010	13,501	
Johore	...	2,573	3,430	3,512	18,184	3,289	16,934	Nil	6	Nil	24	911	6,099	4,622	30,579	...	2,599	3,201	
Kedah	...	504	2,090	2,322	11,262	741	4,180	Nil	Nil	Nil	Nil	636	9,386	3,136	12,278	...	549	2,086	
Perlis	...	36	10	4	30	8	43	Nil	Nil	Nil	Nil	Nil	14	Nil	63	...	32	12	
Kelantan	...	49	107	136	645	147	1,212	63	Nil	147	Nil	20	239	213	1,760	...	73	170	
Trengganu	...	55	50	103	488	52	244	Nil	Nil	Nil	Nil	Nil	155	Nil	732	...	55	50	
Total Malay States	...	21,912	18,499	17,886	89,541	12,348	60,801	63	6	147	24	17,709	13,654	75,268	74,855	...	20,318	19,020	
SETELEMENTS																			
Malacca	...	4,433	1,332	1,292	6,676	(2)	(2)	Nil	Nil	Nil	Nil	4,218	...	19,472	...	...	3,311	1,405	
Province Wellesley	...	86	562	506	2,059	...	...	Nil	Nil	Nil	Nil	...	...	...	...	...	136	574	
Dindings	...	281	87	94	484	1,731	9,274	Nil	13,657	74,952	4,962	...	...	27,715	Nil	...	318	101	
Penang	...	1,179	3,946	11	13	...	...	254	2,588	2,588	...	13,408	...	79,061	...	463	3,597	13	
Singapore	...	3,055	35,323	136	772	...	...	4,242	25,420	25,420	...	...	...	...	...	4,511	34,679	226	
Total Straits Settlements	...	4,234	44,069	2,231	10,004	1,731	9,274	4,496	13,657	28,068	74,952	22,588	Nil	126,248	Nil	4,974	42,041	2,319	
TOTAL MALAYA	...	4,234	65,981	20,730	19,915	99,545	14,079	70,075	4,559	13,663	28,155	74,976	40,297	13,654	201,516	74,855	4,974	62,359	21,339

TABLE III FOREIGN EXPORTS				
Class of Rubber	PORTS		For month	during the year 1932
	Singapore	Penang		
20	...	...	...	...
DRY RUBBER	...	...	...	...
WET RUBBER	...	...	...	...
TOTAL	...	...	...	...

TABLE IV DOMESTIC EXPORTS			
Class of Rubber	AREA	For month	during the year 1932
20	...	...	...
DRY RUBBER	...	...	...
WET RUBBER	...	...	...
TOTAL	...	...	...

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	during the year 1932
Malay States	...	...
Straits Settlements	...	...
MALAYA	...	...
	36,166	171,410

TABLE III
FOREIGN EXPORTS

PORTS	For month	during the year 1932
Singapore	...	23,925
Penang	...	122,523
Port Swettenham	...	9,303
Malacca	...	47,184
MALAYA	...	6,537
	482	27,604
	4,205	...
	40,297	201,516

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	Singapore	Penang	Province Wellesley	Johore	Total
20	21	22	23	24	25	26
DRY RUBBER	14,197	32,279	3,241	3,558	1,117	54,392
WET RUBBER	2,813	2,400	356	207	1,482	7,258
TOTAL	17,010	34,679	3,597	3,765	2,599	61,650

- Notes:—* 1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month, + Consumption. *i.e.*, Column [7] = Columns [13] + [14] + [17] + [19] + [19A] - [2] - [3] - [4] - [5] - [9] - [10]. For the Straits Settlements, Columns [7] and [8] represent purchases by dealers from local estates of less than 100 acres, reduced by 15% to terms of dry rubber.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15%; wet sheet, 25%; scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Domestic exports are estimated by deducting the average monthly dry weight of foreign imports over a period of 2 months from the gross foreign exports of the later month, the foreign exports of the Malay States being domestic production.
5. The above, with certain omissions, is the Report published by W. R. Boyd, M. C. S., Registrar-General of Statistics, S.S. and F.M.S. at Singapore.

METEOROLOGICAL SUMMARY, MALAYA, MAY, 1932.

Locality	AIR TEMPERATURE IN DEGREES FAHRENHEIT				EARTH TEMPERATURE		RAINFALL						BRIGHT SUNSHINE							
	Means of			Absolute Extremes	At I foot At 4 feet		Total		Most in a day		Number of days				Total	Daily Mean	Per cent			
A.	B.	Min.	Max.	Max.	Min.	Lowest	Lowest	Max.	Min.	in.	mm.	in.	Amt.	Precipitation in or more .05	Thunder- storm	Fog morning obs.	Gale force 8 or more			
°F	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.		Precipitation in or more .01				hr.	hr.	%
Railway Hill, Kuala Lumpur, Selangor	91.1	73.3	82.2	94	70	86	76	85.3	85.3	5.39	136.9	1.21	17	14	5	2		179.75	5.80	47
Bukit Jeram, Selangor	89.4	73.7	81.5	92	72	85	76	85.3	86.8	2.15	54.6	1.37	9	6	1	5		196.95	6.35	52
Sitiawan, Perak	90.8	74.1	82.5	95	70	86	77	85.3	85.3	3.88	98.6	1.60	12	7	5			213.10	6.87	56
Kroh, Perak	88.1	70.9	79.5	91	67	82	74	84.2	83.6	5.06	128.5	0.87	21	17	1	1		208.70	6.73	55
Temerloh, Pahang	90.2	73.9	82.1	93	71	83	76	85.9	85.9	5.53	140.5	2.55	14	13	4	8		195.95	6.32	51
Kuala Lipis, Pahang	89.8	72.5	81.1	93	69	84	75	84.8	84.8	8.97	227.8	1.25	17	16	1	17		183.25	5.91	48
Kuala Pahang, Pahang	87.8	74.9	81.8	90	72	84	78	85.2	85.3	6.20	157.7	1.61	13	11		1		241.55	7.79	63
Mount Faber, Singapore	87.5	74.9	81.2	92	72	80	79	81.9	83.3	11.41	289.8	2.99	17	15	6	5		190.30	6.14	50
Butterworth, Province Wel- lesley	89.1	75.3	82.2	91	72	85	78	86.5	85.9	1.62	41.2	0.85	13	9		1		219.75	7.09	58
Bukit China, Malacca	85.9	74.2	80.1	90	70	79	77	84.1	84.9	4.54	115.3	1.69	12	7				207.15	6.68	55
Kluang, Johore	89.0	72.3	80.7	92	70	80	75	82.8	83.1	10.79	274.1	2.56	20	19	8	9	1	180.95	5.84	48
Bukit Lalang, Mersing, Johore	87.9	72.7	80.3	91	71	80	75	83.1	82.5	3.29	83.6	1.00	11	11	1	1		218.10	7.03	58
Alor Star, Kedah	90.1	74.8	82.5	95	72	85	77	87.9	86.9	11.44	290.6	3.66	14	13	11	1	1	247.85	7.99	64
Kota Bahru, Kelantan	91.7	73.5	82.6	95	71	89	75	85.5	85.2	1.57	39.9	0.64	6	5	1			261.75	8.44	69
Kuala Trengganu, Trengganu	90.7	73.3	82.0	95	70	84	75	85.5	85.7	2.01	51.1	1.39	7	5	2	1		255.80	8.25	67
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	75.0	64.5	69.7	79	62	70	66	71.8	72.2	8.32	211.3	1.60	22	18		11		126.95	4.10	33
Pahang.																				
Cameron Highlands, Tanah Rata, Pahang 4750 ft.	73.7	58.5	66.1	77	53	71	64	70.5	69.8	11.13	282.7	1.25	30	24	3	9		130.85	4.22	34
Cameron Highlands, Rho- dendron Hill, Pahang 5120 ft.	72.6	60.8	66.7	76	59	68	62			13.12	333.3	1.57	29	27		4		136.35	4.40	36

Compiled from Returns supplied by the Meteorological Branch, Malaya.

